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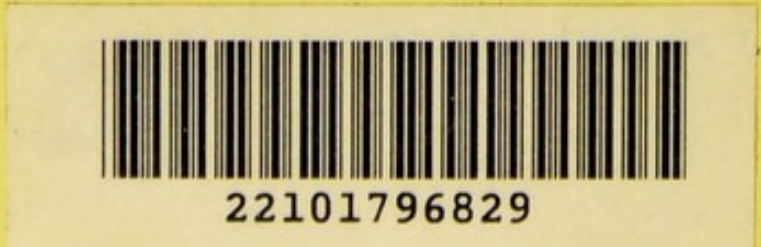

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OCULAR THERAPEUTICS

FOR

PHYSICIANS AND STUDENTS

BY

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(MINDEN, GERMANY)

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TO

C. SCHWEIGGER, M.D.

PROFESSOR OF OPHTHALMOLOGY IN THE UNIVERSITY OF BERLIN

THE

GERMAN EDITION OF THIS VOLUME

IS

Dedicated

BY THE AUTHOR

AUTHOR'S PREFACE.

Since 1817, when Carl Ferdinand Graefe, the father of Albrecht v. Graefe, wrote his "Repertorium Augenärztlicher Heilmittel," no attempt has been made to treat the remedial agents used in ophthalmology exhaustively, and to supply a treatise on the subject that might serve as a guide to the practising physician. This is the more interesting when it is remembered that C. F. Graefe made the assertion that in no branch of therapeutics is the value of the remedies and formulæ to be employed so worthy of consideration as in ophthalmology.

How more nearly true is this assertion at the present time, when this particular branch of medicine has been so greatly amplified and improved!

In reading Graefe's book, one is constantly struck with the thought that although the work is one of this century, yet there seems to have been a constant reversion to the pharmacopeia of the previous hundred years; and conversely, for example, what is even more popularly sold in the shops as "earthworm oil," is there set down as "lumbriorum terrestrium spatulæ," and is described as a fatty animal oil, to be prescribed with oil of rose or honey in the treatment of blepharospasm, it being supposed to

have an antispasmodic action. Numerous varieties of tea, of mucilaginous remedies, oils, and fats are there mentioned, and even a sauce made from the apple is designated as a superior remedy in the treatment of traumatic inflammations. Semmel-crumbs with milk are recommended for stye, etc.

On the contrary, we may know to-day that in inflammations, either moist warmth or cold water dressing is of value, and that, above all, cleanliness and asepsis are the fundamental conditions of proper ocular therapeutics; yet much remains to be learned regarding rational therapy. How often is it found that atropine is ordered without immediate observation as to its indication and its method of action! Moreover, its non-employment is also of frequent consequence; so that, for example, posterior synechiæ, with resultant insidious and painless irido-cyclitis, are overlooked, and treated as a conjunctivitis or a keratitis.

It is true that the abundant medical journal literature furnishes information of most all of the remedies discovered in ophthalmology, but unfortunately, such reports are scattered, and are often inaccessible.

The proper time seems, therefore, to have arrived for collating the most important and the most useful formulæ and arranging them into a single volume. Such a plan also affords interest in the opportunity given of becoming familiar with the methods of treatment in vogue both at home and abroad. To accomplish this object, it has not only been found necessary to consult manuals and journals, but also

to make personal observations at a number of the more important eye-clinics.

Care has been taken to render the subject-matter easy of comprehension, in order that it may meet the requirements of practice. It hardly seems necessary to emphasize the fact that this little volume should not be considered as a text-book of ophthalmology; the subjects of pathogenesis, symptomatology, pathologic anatomy, and diagnosis requiring research among the larger works. In fact, the work lays stress only on treatment.

Repetition in some instances has been found unavoidable, and in others, has been introduced in order to enable the reader to dispense with the necessity of repeated and ofttimes useless search. The book has been written, above everything, by a practitioner for the practitioner.

Thanks are due to Dr. Richard Greeff, Privatdocent in the Royal Eye Clinic at Berlin, for suggesting this work and for his assistance in its preparation.

F. W. Max Ohlemann.

TO

WILLIAM F. NORRIS, A. M., M. D., (UNIV. PA.)

PROFESSOR OF OPHTHALMOLOGY IN THE UNIVERSITY
OF PENNSYLVANIA

THIS

ENGLISH EDITION OF DR. OHLEMANN'S WORK

IS

Affectionately Dedicated

AS A SMALL TRIBUTE FOR THE MANY KINDNESSES SHOWN THE
EDITOR

EDITOR'S PREFACE.

The belief that an association of the best work of the Continental writers on ocular therapeutics might be brought together into a combined form, and that such an association would prove of value not only to the practical English-speaking ophthalmologist but to the profession at large, and the knowledge that in the work of the present author an authoritative and valuable exposition of the subject as now known abroad has been given, have been the inducements to present the accompanying authorized translation to the American reader.

Throughout the entire work, care has been taken where a drug or a preparation is unofficial in the United States Pharmacopeia, to have the source from which it has been taken ascertained, and the strengths of its components given. As the original work has all of the drug-values expressed in the metric system of weights and measures, these have been retained,—the nearest equivalent in apothecaries weights and measures being noted immediately after the metric dose of each ingredient.

The style of the original manuscript has been adhered to as strictly as is consistent with English construction. All of the formulæ have been copied,

so that no confusion might arise in the many references made throughout the volume, the auxiliary ones being given as briefly as possible.

A copious cross-reference index for disease, drug, and author, which will greatly enhance the value of the book as a ready guide for the therapeutist, has been made; besides which, the general trend of the volume, as shown in the table of contents, is as strictly logical as could be obtained under the circumstances.

In the preparation of the work, which has been beset with many difficulties, thanks are due to Dr. William Zentmayer, an assistant surgeon at the Wills' Eye Hospital, and to Dr. Mary E. Gillespie, one of the editor's former clinical assistants, for careful and conscientious research into a great mass of literature and for the proper arrangement of the material at hand; while to Dr. David Riesman, the credit of making the translation from the original is due.

CHARLES A. OLIVER.

PHILADELPHIA, 1899.

TABLE OF CONTENTS.

GENERAL PART.

SPECIAL PART.

ointment about the size of a pea. In order to prevent transmission of disease to other patients, these, after once used, are thrown away. Glass rods that can be readily cleansed may also be employed.

In the main, the method of massage introduced by Pagenstecher consists in a series of gentle stroking movements made upon the closed eyelids with the thumb and index-finger, in centripetal, centrifugal, and circulatory directions.[1]

Recently, tapottement has been employed by Maklakow.[2] By means of a dentist's automatic hammer, he causes a vibratory movement of very great rapidity to act upon the surface of the eye (nine thousand vibrations per minute, as determined by the use of the Edison's pen).[3]

Action of Massage.—In the eye, as in other parts of the body, absorption is stimulated to a greater degree through the changes in pressure than the lymph-stream *vis a tergo* is able to accomplish. Therefore, capillaries and lymph-paths are more rapidly emptied and conditions of stasis are improved, in a sense that may be considered compensatory for the elasticity that is lost by the vessels during inflammatory processes. Further, it is stated that the pressure in the anterior chamber is reduced. By some it is believed that the varying degrees of

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[1] Concerning Michel's method, see chap. viii.

[2] "Centralblatt für praktische Augenheilkunde," 1895, Januar Heft.

[3] This so-called tetanization has been employed with favorable results in iritis, cyclitis, scleritis, parenchymatous keratitis, hypopyon keratitis, and trachoma.

pressure produce profound influences on the more distant vessels, so that even in case of embolism the clot may be made to absorb or to disappear. It is also thought that by such means collateral circulation is favored.

These facts indicate the application of the method. As to the drug used in the most frequent forms of corneal diseases, such as phlyctenulæ, oxide of mercury and corrosive sublimate ointments may be employed. In other forms of corneal infiltration in which absorption is slow, the following salve has been recommended by Mitvalsky :

1. ℞. Unguenti hydrargyri cinerei, ... 30 c.c. (gr. l)
Vaselini amari albæ,[1] . . . . . 60 c.c. (gr. c)
Lanolini purissæ, ... 30 c.c. (gr. l).
Misce et fiat in unguentum.
SIGNA.—Ointment for eye. (Mitvalsky.)

Massage is contraindicated in irritative conditions ; therefore, as a rule, it should not be employed during the first stages of inflammation.

In several countries it is used in trachoma. Hirschberg employs it very actively in cases of embolism of the retinal artery, taking care to first cocainize the eye. Förster recommends it to be used during the operation for artificial maturation of cataract. Burchardt makes it an important adjuvant in the treatment of blennorrhagia. Finally, the method is useful in the treatment of rhagades at the angles of the lids.

To this form of mechanic treatment belong a series

[1] German Pharmacopeia.

of manual procedures, among which are the expression of trachoma granulations and the scraping with sharp spoons, Knapp's roller-forceps, etc. In this category belong the employment of sounds in diseases of the lacrimal apparatus and tattooing in the treatment of corneal opacities.

CHAPTER II.

THERMIC AGENTS.

Primarily, compresses and lotions will be dealt with, and, secondarily, bandages will be considered. Under the head of Compresses, cold, heat, and other applications will be discussed.

1. COLD APPLICATIONS.

Applications of cold, either in the form of compresses or of Leiter's tubes,[1] find their chief use in acute inflammation and injuries. Where the skin of the lids is sensitive, it should, unless precluded by the presence of wounds, be previously anointed with almond oil. Ordinarily, the application should be made for a period of time averaging from a quarter of an hour to a half of an hour, three or four

[1] Hirschberg has found that these tubes are impracticable. In Austria and South Germany they are not much used.

times daily. In mild cases, boiled water, which has been allowed to cool, is sufficient.

Where there are abnormal secretions, either purulent or infectious, astringents or antiseptic solutions are necessary.

Although the consideration of the application of these latter solutions belongs to the Chapter on Chemic Methods, yet it has been considered more convenient to discuss them here.

In simple catarrhal inflammation, boric acid, two to four gm. to a quarter of a liter of water (gr. xxx–lx ad f℥viij) can be used. This should be more generally employed than the following: Liquor plumbi subacetatis, five to ten drops to a quarter of a liter (gtt. v–x ad f℥iv) or a one to one thousand strength solution of zinci sulphatis. If the secretions are infectious, the following are valuable: Chlorine water, one tablespoonful to a glass of water (f℥iv ad f℥viij); one per cent. solution of boric acid; a mixture of chamomile tea and a solution of salicylic acid, three to one thousand; equal parts of warm chamomile tea and two per cent. of salicylic acid solution; corrosive sublimate water, one to five thousand; or a solution of salicylic and boric acids, in water. Permanganate of potassium, which was formerly so much in vogue, is now almost abandoned.

The substitution of ice for cold applications, even to the employment of the ice-bag on inflamed eyes, depends upon the intensity and the stage of the existent disease. Thus, in severe blennorrhea, ice-

applications should be constantly employed during the first few days. After this, there should be half-hourly interruptions between the applications, which should last an hour each (Schmidt-Rimpler). Then they should be reduced to four or five times daily for an hour each, and for a half an hour each, two or three times at night (Hirschberg). Later, the time of each should be lessened, and there should be a fewer number of applications. According to Meyer, they should be made, for the first few days, while the patient is in a recumbent position. Recently, Burchardt[1] has announced that he has obtained good results with moist, warm antiseptic dressings, and claims to have seen an increase of the disease-process under ice-applications. He considers the former method of procedure also preferable for fresh wounds, and ranks antisepsis as the chief factor in the production of a favorable result. Fick[2] rejects the ice treatment in blennorrhea.

By adopting the golden mean, one is not apt to commit an error in practice. In the first days of an increasing blennorrhea in adults, ice should be frequently employed. Should the chemosis increase and the cornea begin to take part in the disease, rendering it questionable whether the circulatory conditions of this membrane, already disturbed, might become still more impaired, thus producing

[1] Burchardt, "Centralblatt für praktische Augenheilkunde," 1893, S. 262 und 321.

[2] Fick, "Handbuch der Augenheilkunde," Zürich, 1894.

an artificial ischemia, then Burchardt's modification is probably indicated. It may, therefore, be laid down as a rule that the more acute and the more intense the inflammation, the colder should be the applications; this, however, is applicable only to disturbances of the conjunctiva and the lids.

Douches.—Another form of the application of water is the douche. It can, if desired, be applied by means of an irrigator, which is placed above a wash-stand. Douches may be recommended in mild forms of conjunctivitis and conjunctival asthenopia, and to afford assistance to the action of eye-drops and ointments. To the water of irrigation, eau de Cologne, boric acid, or mistura oleoso-balsamica,[1] a full teaspoonful, shaken in a half to one liter of the water or wash (f℥viij to Oj), may be added. It is not absolutely necessary that an irrigator should be employed. These applications can also be prescribed as simple collyria. Apothecaries frequently dispense Romershausen's eye-wash, which consists of fennel seed and dilute alcohol, with five parts of water. The simplest solutions are cold boiled water and French brandy, or alcohol in water. Further prescriptions are:

2. ℞. Hydrargyri chloridi corrosivi, 0|02 gm. (gr. iij)
Aquæ fœniculi,
Aquæ rosæ, ... āā 100|0 c.c. (f℥iij et f℥j).
Misce et fiat in collyrium.
SIGNA.—Wash for the angles of the eyelids.

[1] *Vide* German Pharmacopeia.

3. ℞. Misturæ oleoso-balsamicæ,[1] . 25|0 gm. (f℥ vj).
Misce et
SIGNA.—Teaspoonful to a glass of water.

4. ℞. Spiritus melissæ compositæ,[2] 100|0 c.c. (f℥ iij et f℥ j)
Spiritus lavandulæ, ... 25|0 c.c. (f℥ vj et ♏ xv)
Spiritus camphoræ, ... 3|0 c.c. (♏xlv)
Spiritus etheris nitrosi, . . . 2|6 c.c. (♏xl)
Olei rosæ, ... 0|1 c.c. (♏jss).
Misce et fiat in collyrium.
SIGNA.—Eye-spirits (Pagenstecher, Koenigstein).

5. ℞. Potassi permanganatis, . . . 1|0 gm. (gr. xv)
Aquæ destillatæ, ... 100|0 c.c. (f℥ iij et f℥ j).
Misce et
SIGNA.—To be diluted to the color of wine (for use in blennorrhea).

6. ℞. Acidi boracici, ... 2|25 gm. (gr. xxxiv)
Aquæ amygdalæ amaræ, . . . 5|0 c c. (f℥ j et ♏xv)
Aquæ rosæ, ... 100|0 c.c. (f℥ iij et f℥ j).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

7. ℞. Misturæ oleoso-balsamicæ,[3] . 10|0 c c. (f℥ ij et ♏ xxxiv)
Spiritus lavandulæ, ... 20|0 c.c. (f℥ v et ♏ viij)
Aquæ fœniculi, ... 70|0 c.c. (f℥ ij et f℥ ij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

8. ℞. Aquæ fœniculi, ... 50|0 c.c. (f℥ j et f℥ ij)
Solutionis zinci sulphatis (one per cent.), ... 150|0 c.c. (f℥ iv et f℥ vss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

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[1] In the Royal Eye Clinic, in Berlin, the following is prescribed:

℞. Hydrargyri chloridi corrosivi, 0|04 gm. (gr. vj)
Aquæ destillatæ, ... 200|0 c.c. (f℥ vj et f℥ ij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

[2] "Zur Temperatur-Topographie des Auges und über kalte und warme Umschläge," "Archiv für Augenheilkunde," 1893, S. 141.

[3] *Vide* German Pharmacopeia.

2. WARM APPLICATIONS.

In inflammation of the cornea, the iris, and the sclera, only warm applications are to be made. These should be employed three or four times daily, for periods of from one-half to one hour each. The temperature should, as a rule, be kept at from 42° to 45° C. (107⅗° to 113° F.). If the applications are made by an attendant, it is important for the physician to control them, for it often happens, especially in Winter, that the patient is given boiling water in a vessel from which the heat of the water is soon lost; and, in consequence, if later the physician makes investigation, he will find that the patient is not using warm, but almost cold, applications, thus frequently finding the explanation why, in a case of severe iritis, "warm applications" are not being well borne. In such instances it is less obligatory to employ antiseptic solutions.

Dry Heat.—This variety of heat is usually employed in the form of herb-pillows. Fick recommends its use in the treatment of styes. It is, however, rarely employed by physicians, though it is generally used in domestic practice. Dry heat possesses the advantage over moist, warm applications, in the fact that the heat is more constant, and that it does not so readily cool the eye. It is, therefore, greatly praised and preferred by the patients.

In general, it is wise to be guided in the use of such applications by empiric experience. This conclusion (of Silex) has been rendered after his having

made some interesting physiologic experiments in the use of warm and cold applications to the eye.

3. BANDAGES.

The bandage which at present enjoys the greatest popularity is the one that is made of cambric. While formerly mull and linen strips were laid directly on the lid, and upon these some cotton was packed, and over all a bandage as a monocle was placed, it is at present the custom to moisten mull or cotton strips with antiseptic solutions, or to employ bandages with iodoform gauze. Instead of the monocle, with its long piece, and three or four turns, a simple cambric strip, with an underlying sheet of gutta-percha paper, may be employed for dispensary practice or walking cases in affections of the lid and cornea, or in deeper diseases of the eye. Such bandages remain moist and warm for a long time.

In the Royal Eye Clinic at Munich it is customary to keep small, square pads, made of gutta-percha and mull, on hand, these being also employed when, for example, in phlyctenulæ, the eye is being treated with yellow oxide of mercury ointment.

Several modifications are made in the use of the monocle after operations. After cataract extraction a starched mull bandage, without plaster-of-Paris, should be laid over the covering strip, the dressing thus receiving a hard shell, as it were, and prevented from slipping. This modification is also applicable for children.

Fuchs applies shell-shaped wire screens, about ten c.c. (four inches) long and seven to eight c.c. (two and eight-tenths to three and two-tenths inches) wide, which are laid over the bandage and fastened by means of tapes. No monocle is employed. After the moist corrosive sublimate gauze has been placed on the lid, a pad of cotton is fastened, with adhesive strips, in front of the eye. Over this the wire screen is laid. Königstein applies white flannel and white tapes.

In cases of gonorrheal infection, where it is necessary to protect the healthy eye from the secretions of the diseased one, isinglass or a watch crystal fastened to the surrounding skin surface of the unaffected eye with collodion and adhesive strips, may be employed. Königstein mentions a method that is useful in cases where the foregoing articles are not at hand. He places iodoform gauze over the eye and superimposes a little cotton and gutta-percha paper, sealing the entire dressing with collodion.

A gelatine-bandage employed by Unna has been introduced into France. At least, it has been recommended by Braquehaye[1] as a substitute for the usual bandage. Its composition is—

9. ℞. Zinci oxidi, ... 10|0 gm. (ʒij et gr. xxxiv)
Gelatini, ... 35|0 gm. (ℨj et ʒj)
Glycerini, ... 20|0 c.c. (fʒv et ♏viij)
Aquæ destillatæ, ... 35|0 c.c. (fℨj et fʒj).

To this formula may be added iodoform, salicylic acid two per cent., carbolic acid, etc.

[1] "Archives d'Ophtalmologie," xiv, No. 5, p. 300.

According to the author, this bandage is especially adapted for wounded lids. It may be directly applied to the skin, or a thin layer of cotton may be placed beneath it. It is then covered with cotton and iodoform gauze. In order to permit the passage of air, an opening is left in the center of the bandage. The whole is covered with a piece of gauze. The advantage claimed for this dressing is that the head remains free, thus rendering daily toilet possible. It is indicated as a protection in blennorrhea, but is contraindicated in weeping eyes, and for use among children.

To protect the bandage in children, the arms may be placed as far as the wrists in pasteboard splints, so that the elbows can not be bent. In special cases, as after cataract operations, the hands can be loosely fastened to the bed, in order to check their involuntary movements, which may threaten the bandage.

Text-books distinguish between protection, covering, and pressure-bandages.

Ordinarily, however, the protective bandage and its modifications are alone employed. The pressure-bandage is reserved for cases such as detachment of the retina. Burchardt claims to have seen a replacement of this membrane occur in twenty-four hours' time, by the use of the pressure-bandage; but there are authors who report opposite results. In this case he employed a flannel bandage and pressed the cotton firmly against the eye: in other words, he made use of a pressure-ban-

dage. Here, too, the middle ground is the best. Above all, it is to be noted that a bandage applied *secundum artem* should never oppress or distress the patient. If such should be the case, where the bandage is properly applied, relief can at once be obtained by pouring a few drops of an antiseptic solution on the dressing.

A word as to the solutions to be employed with the bandages. A solution of corrosive sublimate—one to two thousand, one to five thousand, or one to ten thousand—is most frequently used. Especially to be recommended is the method employed in Fuchs's clinic in Vienna, where to two per cent. and five per cent. solutions a little fuchsin and methyl-blue respectively are added to prevent mistakes. Burchardt prefers a solution of chlorine water, with semi-moist or moist bandages. He dips small pads of boric-acid cotton in chlorine water and places a thin layer on the lids. Over this he places a dry pad and fastens it with turpentine collodion, which adheres more readily than the pure or the elastic collodion.

10. ℞. Collodii, ... 100|0 c.c. (f℥iij et f℥j)
Terebinthinæ laricinæ,[1] . . . 3|0 c.c. (f℥vj et ♏xlv).
Misce et
SIGNA.—For Surgeon's use.

As a further advantage of this dressing, it is asserted that the patient cannot loosen it, that it can remain in position several days, and that it renders a bandage superfluous.

Burchardt, in his method of treating blennorrhea,

[1] German Pharmacopeia.

(Chap. xiii), considers a protective bandage over the second eye unnecessary. In private practice the boric-acid solution in two to four per cent. strengths, as employed in many clinics, is useful. A teaspoonful of this should be dissolved in a glass of water.

CHAPTER III.

CHEMIC AGENTS.

It is difficult to make a sharp separation between the remedies to be discussed in this Chapter ; but yet it is necessary, for purposes of a better survey of the subject, to establish some classification.

1. ANTISEPTICS.

At the present day aseptic and antiseptic measures occupy a foremost place in ocular therapeutics, and their consideration naturally follows the preceding Chapter which dealt with compresses and bandages. There is, however, no general uniformity in the application of such agents, although the principle underlying their use is the same. Indeed, there exists great difference in the method of their employment in different clinics. This ought, however, not to confuse the practitioner, but rather to teach him that there are various methods of treatment, all of which are more or less good.

An important point to be remembered is that the

antiseptics must be used in a different manner for instruments, the hands, and the eye.

Phenol solutions should not be brought in contact with the eye, as even five per cent. solutions are destructive to the corneal epithelium. The remedies and measures employed in surgery are in general also applicable in ophthalmology. Corrosive sublimate and phenol in solution here likewise predominate, with this fundamental difference, however, that carbolic-acid solutions should be used only for instruments and corrosive sublimate for the eyes, as the former irritate the eye and the latter ruins the instruments.

Preparation of the Instruments.—In the majority of clinics the instruments are placed in a three per cent. strength phenol solution. Such a strength retards germ-growth, while a five per cent. one prevents it entirely (Hirschberg). The instruments should be placed in boiling water before using. The method of Hirschberg is more thorough than this: he boils the instruments, then places them in phenol solution, and finally dips them into a one to five thousand corrosive sublimate solution to remove the phenol.

Schweigger has on his instrument-table a small stove, which enables him to immerse the instruments directly from the phenol solution into boiling water.

For the instruments, Burchardt employs a solution that is composed of solveol,[1] six grams (℥iss), lysol,

[1] German Pharmacopeia.

0.1 gram (gr. iss), and distilled water, one thousand grams (Oij). This he does because he thinks that such a solution will not, like phenol, attack the instruments. Schmidt-Rimpler leaves the instruments for one-half an hour in a two per cent. strength phenol solution, and then tests their sharpness. He then dips them into a four per cent. strength phenol solution, drying them with a sterile linen cloth. Just before the operation he dips them into a corrosive sublimate solution of one to two thousand strength.

For washing of the hands, aside from the use of soap and brush, corrosive sublimate, one to one thousand strength, may be employed. This solution, however, is too strong to be brought in contact with the eye. It may, however, be used for the disinfection of brushes, glass rods, and droppers. Cotton and sponges should be kept in two per cent. strength solutions in closed glass jars.

Eye Waters.—Collyria which are to be employed in important operations should be prepared just before using.

Franke[1] has proved that solutions of the alkaloids in sublimated water, one to ten thousand, remain germ-free for only one hour. Hirschberg has proposed, therefore, to use one to five thousand strengths of the antiseptic agent. Burchardt recommends a five per cent. strength solution of chlorine water with the addition of salicylic acid and chloral. This is,

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[1] "Archiv für Ophthalmologie," xxxix, 3.

however, used by him only for compress solutions and for cleansing the eyes. Why he employs the

11. ℞. Acidi salicylici, ... 0|7 gm. (gr. x)
Acidi borici, ... 30|0 gm. (ʒvij et gr. xlij)
Chloral hydratatis, ... 1|5 gm. (gr. xxiij)
Aquæ chlorita (5 : 100), . . 1000|0 c.c. (Oij).
Misce et
SIGNA.—For surgeon's use.

chloral, he does not say. Although others consider that the antiseptic action of salicylic acid in the strength of three per cent. is ineffective, yet Burchardt states that he protects eserine solutions from decomposition by the use of it in the strength of seven-tenths of a gram in a thousand (gr. x ad Oij), while incidentally preventing the solutions from turning red under the influence of light.

Sattler recommends and uses the following formula :

12. ℞. Acidi borici, ... 10|0 gm. (ʒiiss)
Acidi salicylici, ... 2|5 gm. (ʒj et gr. xv)
Aquæ destillatæ, ... 500|0 c.c. (Oj).
Misce et
SIGNA.—For Surgeon's use.

More recently, mercuric oxycyanide ($HgO_1Hg(CN_2)$) has acquired a special reputation. According to Schlösser[1] (Munich), it possesses the same antiseptic properties as corrosive sublimate, but does not irritate the tissues as much as the latter. In consequence of this it can be used and borne in fourfold strength. Moreover, it can be employed for the sterilization of instruments, since these are not injured by it. In one or two per cent. strength

[1] "Bericht der Ophthalmologischen Gesellschaft," Heidelberg, 1893, S. 94.

solutions it is used as an application in conjunctivitis, and in the strengths of one to five hundred to one to one thousand, it is employed in suppuration of the lacrimal sac and in blennorrhea.

Seggel[1] recommends oxycyanide of mercury in one to ten thousand strength for washing the conjunctiva and lids. He also praises it for its antiseptic and non-irritant properties, stating that there is no remedy which in such dilutions possesses similar positive germicidal power.

Michel remarks that in the preparation of corrosive sublimate solutions of one to one thousand strengths, scarcely twenty per cent. of the drug is dissolved. He believes that it is therefore wise, by boiling, to deprive the ordinary tap water of its lime and magnesia, or to change these materials into salts by the addition of an acid—0|5 gm. (gr. viiss) of acetic acid to a liter (Oij) of water being sufficient.

Bandages are to be sterilized with steam at 100° C. (212° F.) in a sterilizer. Bottles and other glassware, with their solutions, should be sterilized in a like manner for half an hour at a time. These aseptic procedures are, as a rule, however, difficult and expensive in private practice. Moreover, the conjunctiva, in measure, is less exposed to infection with pathogenic germs than other parts of the body (Michel), because it is protected by a constant tear flow. The greatest danger that threatens the eye is the passage of germs from the lacrimal sac. For this

[1] *Ibidem*, p. 98.

reason, Burchardt employs a combination of chlorine water (five per cent.) with salicylic and boric acids (0|7 gm. (gr. xij)) (thirty parts to one thousand of water). On the other hand, Hirschberg considers corrosive sublimate in one to five thousand strength, the most important agent in ophthalmology, and states that the indications for its use are as follows: First, for compresses; second, for washing the conjunctival sac before operations; third, for the cleansing of wounds; fourth, for irrigating fresh wounds of the eye; fifth, for use with moist dressings; and sixth, as a solvent for the alkaloids. He says, however, that when atropine is employed several times daily, —as, for example, in iritis,—the proportional strength of the mercury in the solution should be but one to ten thousand.

Subconjunctival Injections. — Among the modes of treatment of a number of ocular affections is to be named one of using corrosive sublimate in the form of subconjunctival injections, which has gained many adherents in different countries. Especially is this so in Italy, France, and Holland, where it is extensively employed. Its action, aside from the special one of inducing a more rapid absorption of the exudates, is said to consist in producing increased ordinary absorption and osmosis.[1] By the use of the method, Reymond (Turin) has obtained good results in sympathetic iridocyclitis. Abadie (Paris) has even injected it into the vitreous body, though

[1] Klinische Monatsblätter für Augenheilkunde, 1892, S. 332.

Valude cautions against such procedures. Snellen recommends the injections in scleritis, while Darier uses them in iritis, especially when the condition is of syphilitic origin.

This enthusiasm is not shared in Northern Germany, where it is said that the chief action of the method is the production of extensive adhesions between the conjunctiva and the sclera; and where it is believed that the injection of ordinary table salt beneath the conjunctiva—which was used as early as 1866 by Rothmund[1] in the treatment of corneal opacities—has the same effect as injections of the corrosive sublimate solutions.

Van Moll[2] describes the method as follows: After two preliminary instillations of a ten per cent. solution of cocaine (a two per cent. solution is sufficient) into the conjunctival sac, a fold of conjunctiva is lifted and three-twentieths of a milligram of corrosive sublimate, with five milligrams of hydrochlorate of cocaine, is injected beneath the mucous membrane; this quantity being secured by using one and one-half divisions of a Pravaz syringe, filled with a one to one thousand strength of corrosive sublimate solution, followed by a one-half division of a sterilized ten per cent. solution of cocaine.

The method is employed in keratoscleritis, syphilitic, arthritic, and plastic iritis, and traumatic iridocyclitis. Van Moll has further noted rapid cure

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[1] "Klinische Monatsblätter für Augenheilkunde," 1866.

[2] "Klinische Monatsblätter für Augenheilkunde," 1892, S. 332.

after injections of 0.025 strength of sodium salicylate, with 0.005 strength of cocaine, in the following cases: Chronic scleritis, with permanent cure after three injections; mild episcleritis, after two injections; recurring kerato-iritis, after one injection; and diffuse keratitis, after two injections. Corrosive sublimate injections are, therefore, to be recommended in iritis, iridocyclitis, and parenchymatous keratitis, while sodium salicylate injections are useful in scleritis and interstitial keratitis.

The importance of the subject and the different opinions of the authorities of different countries render it necessary to enter somewhat fully into the history of the method. This is particularly the case since such a great number of diseases that are important to the medical practitioner are concerned.

At the Ophthalmological Congress in Edinburgh[1] in 1894, a number of ophthalmologists discussed the value of bichloride of mercury injections. The result was briefly as follows: Hess declared that he had never observed in his experiments upon corneal ulcers the slightest influence on the course of the disease. Deutschmann reported on two thousand separate injections, with the conclusion that he had seen better results in parenchymatous keratitis than from any other method. The injections were especially recommended in specific and non-specific iritis, as well as in all infectious processes, particularly those following operations. They were found to be less

[1] "Klinische Monatsblätter für Augenheilkunde," 33 Jahrg., 23. Oct., S. 325.

valuable in chorioiditis and chorioidoretinitis. Dufour was of the same opinion, despite the fact of the negative results that had been experienced by Hess and Bach. Guttmann had not observed unquestionable results in either the parenchymatous form of keratitis or in chorioiditis. Chibret and Darier, like Deutschmann, also reported contrary results.

In view of such difference of opinion, it is gratifying that, later, Schmidt-Rimpler discussed the subject of subconjunctival injections more fully. His method differs somewhat from that of Van Moll. His plan is to inject one to five drops of a mercuric chloride solution of one to one thousand strength into the conjunctiva at a distance of seven millimeters from the corneal margin; this being done under cocaine anesthesia. He also employs a one to two thousand strength solution or a one to one thousand strength solution, plus a one-tenth per cent. strength of sodium chloride, in order to secure readier absorption. According to Pflüger,[1] iodine trichloride in one thousand to two thousand strength can be used.

It may be here stated that in many cases it is necessary to give a considerable number of injections.

Darier gives the indications for the employment of subconjunctival injections as follows: (1) Traumatic and operative infections, hypopyon keratitis; (2) torpid parenchymatous keratitis, exudative ker-

[1] "Therapeutische Monatshefte," 1895, März. S. 113.

atitis, plastic keratitis; (3) syphilitic diseases of the eye;[1] (4) inflammation of the optic nerve.

The use of the injections has demonstrated the absence of any antibacterial action. They produce a marked edematous inflammation, which precludes daily application. If they are thus employed, abundant scar-tissue, together with adhesions between the conjunctiva and sclera, is produced.

In hypopyon keratitis, in which about ten injections are required, better results were obtained with iodoform and chlorine-water. In parenchymatous (diffuse) keratitis, in part complicated with iritis, no arrest in the progress of the disease nor improvement could be observed. In ulcerative processes of the cornea no effect was obtained, even when the number of injections was increased to fifteen. In cases in which improvement followed, atropine and moist warmth had also been employed. In episcleritis there was no result after twenty injections. Some influence was noted in serous iritis. Sodium salicylate was, however, administered at the same time. A total of nineteen injections being made in this disease.

No improvement occurred in traumatic chorioiditis and iridocyclitis; likewise no advantage, despite twenty-four injections, was gained in their use in cases of vitreous opacities; the result being similar in retrobulbar neuritis. Amelioration occurred in

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[1] He states that circulatory disturbances of the eye contraindicate the employment of the injections.

neuroretinitis, but this was obtained under the conjoined influence of the sweat-cure. In five cases of chorioretinitis no effect was procured. In a case of simple chorioiditis improvement occurred after four injections.

Schmidt-Rimpler therefore concludes that only in iritis and chorioiditis are further tests in this direction of any value. The real influence, he believes, is dependent upon the stimulation of absorption that is produced by an increase in the blood- and lymph-circulation.

In accord with these observations are those of Werkmeister.[1] He also saw no noteworthy results, believing, however, that Darier's method merits consideration in cases of acute inflammation of the uveal tract.

Darier's paper[2] on subconjunctival corrosive sublimate injections (in reply to the unfavorable criticism of Mellinger (Basel) and Guttmann (Berlin)) states that, in order to avoid unnecessary irritation and adhesions, the injections should not be made too close to the corneal margin, and they should not be entered too deeply under the conjunctiva, in order in part to avoid Tenon's capsule. Further, a mercury preparation which does not precipitate the cocaine should be chosen for employment, this condition being fulfilled by the salt mercuric cyanide.

It is not the author's intention to pass judgment

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[1] "Wiener klinische Wochenschrift," 1894, 3.

[2] Translation by Greeff, in "Archiv für Augenheilkunde," xxx.

on this question, though it is striking that in one case of chorioiditis Darier reached one hundred and twenty-five injections. Later, Mellinger reported[1] that he had observed good results from the use of salt injections in conjunction with the customary therapy (atropine, eserine, antiseptic washes, and moist heat) in infectious processes of the cornea, corrosive sublimate injections having been previously used by the same author.

The following rules may, therefore, be laid down: First, in destructive diseases of the cornea, the injections, whether of corrosive sublimate or of chloride of sodium, should not be used alone, but should be employed conjointly with the methods of treatment heretofore in vogue. Second, in diseases of the chorioid, retina, optic nerve, and vitreous humor, and in iridocyclitis, subconjunctival injections may be employed as the sole treatment, either sodium chloride or mercuric chloride being used; good results have been observed from the use of the former drug alone.

Another antiseptic material of recent years is formaldehyd, which has been recommended by Valude at the Congress of French Ophthalmologists. Gepner, of Warsaw, has also reported concerning its value.[2] The remedy (CH_2O) is employed similarly to mercuric chloride in operations, and in all forms of conjunctivitis, in the strengths of one to one thousand and one to two thousand. Such

[1] "Klinische Monatsblätter für Augenheilkunde," 1895, S. 130.

[2] "Centralblatt für praktische Augenheilkunde," 1894.

solutions produce a pricking sensation and a hyperemia of the conjunctiva, which rapidly disappear. Excessive secretion is often diminished in a surprising manner by its employment.

In the beginning of a case of gonorrheal conjunctivitis, complicated with a deep corneal ulcer and excessive suppuration, the conjunctiva was irrigated with a solution of one to one thousand and one to two thousand strengths of formaldehyd every second hour. After four days' time the secretion was controlled. Eserine was also employed, and a two per cent. solution of nitrate of silver was twice applied. Formaldehyd may, therefore, be recommended in some cases of catarrhal conjunctivitis, especially in blennorrhea neonatorum. It is also adapted for cleansing the lacrimal sac.

A comparison of antiseptic solutions of one to five thousand strengths of corrosive sublimate in sterilized water, and formaldehyd has shown that after enucleation, when either of the first two materials are used, a mucopurulent discharge occurs, whereas no secretion follows when the last is employed.

In beginning secretion from the wound after cataract extraction, Valude has effected a cure by means of several instillations of a one per cent. solution of formaldehyd. The value of the remedy is said to consist in its property of exerting a species of permanent antiseptic action, while corrosive sublimate solutions, on the other hand, do not remain germ-free. Owing to this property, formalde-

hyd is said to be a valuable agent in protecting collyria against contamination.[1]

Warm chlorine-water, a tablespoonful to a liter (℥ss ad Oij) of water has, at times, like corrosive sublimate solutions, been used for compresses.

Salt solutions of six-tenths of one per cent. strength, sterilized with hot steam, are said to possess antiseptic properties, but can exert these powers only when in a fresh state.

Salicylic acid in three per cent. strength, boric acid in four per cent. strength, and benzoate of sodium in five per cent. strength, are all considered unsafe by Hirschberg.[2]

Iodoform is not a powerful antiseptic, but its ability to check secretion is well known. Therefore its employment is limited to operations, especially when used in the form of a powder or an ointment. It is valuable after plastic operations, in diseases of the lacrimal sac, in fresh wounds (especially of the cornea), and in caries situated in the neighborhood of the eye. The best method of its application is unquestionably that in which it is combined with cumarin, this combination being known as deodorized iodoform. Notes on the use of similar substances—such as aristol, europhen, salol, and almunol—are found in literature, but these remedies have not yet had sufficient trial to absolutely determine their relative values (see Chap. IX).

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 447.

[2] "Einführung in die Augenheilkunde," 1892.

2. ASTRINGENTS.

This class of drugs consists in those remedies which were formerly included under the terms tonics (Binz), caustics, antiphlogistics, topical remedies or irritants (Königstein), etc. Among them nitrate of silver, sulphate of zinc, acetate of lead, sulphate of copper, tannin, alum, and biborate of soda are all worthy of mention. In the form of pencils they are used to some extent in substance. Chiefly, however, they are employed in solutions and in ointments. The mercury preparations are made in the form of powders, solutions, and ointments, and may also be added to this class.

Argenti Nitras.—The action of solutions of nitrate of silver is construed to be dependent upon the property of the drug precipitating the albumin of the superficial epithelial layers with which it comes in contact ; these layers, according to Hirschberg, being mechanically loosened and, together with the contained bacteria, removed.

As a practical rule,[1] Hirschberg advises the use of a solution of one-half of a one per cent. strength in catarrhal conjunctivitis, one per cent. strength in trachoma, and two per cent. strength in blennorrhea. The solutions are to be kept in brown bottles.

13. ℞. Argenti nitratis, ... 0|1 gm. (gr. j)
Aquæ destillatæ, ... 20|0 c.c. (f℥ vj).

14. ℞. Argenti nitratis, ... 0|25 gm. (gr. iij)
Aquæ destillatæ, ... 25|0 c.c. (f℥ vj et ♏xxv).

1 "Einführung in die Augenheilkunde," 1892.

15. ℞. Argenti nitratis, ... 0|5 gm. (gr. vij)
Aquæ destillatæ, ... 25|0 c.c. (f℥vj et ♏xxv).
(Hirschberg.)

Upon account of the strong action of the mitigated stick it is no longer recommended. Indeed, it has been repeatedly observed that the weaker the solution of the drug, and the more frequent its application, the better is the result (Burchardt, *et al.*). It is, therefore, well to use a one-sixth per cent. solution for instillation four to six times daily (see Chap. IX).

Its prolonged use is contraindicated on account of the danger of gray discoloration of the conjunctiva.

16. ℞. Argenti nitratis, ... 0|1 ad 0|2 gm. (gr. iss ad gr. iij)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).

17. ℞. Argenti nitratis, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 60|0 c.c. (f℥j et f℥vij).
(Burchhardt.)

Zinci Sulphas.—For touching the conjunctiva solutions of one to two per cent. strengths of this drug should be used; for instillation, one to five hundred strengths may be employed; and for compresses, one to one thousand is sufficiently strong.

18. ℞. Zinci sulphatis, ... 0|03 gm. (gr. $\frac{4}{10}$)
Aquæ opii,[1] . . . . . 15|0 c.c. (f℥iv).

19. ℞. Zinci sulphatis, ... 0|03 gm. (gr. $\frac{4}{10}$)
Aquæ destillatæ, ... 15|0 c.c. (f℥iv).

20. ℞. Zinci sulphatis, ... 0|25 gm. (gr. iij)
Aquæ destillatæ, ... 250|0 c.c. (f℥viij et f℥iij).

21. ℞. Zinci sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 25|0 c.c. (f℥vj et ♏xxv).

[1] See German Pharmacopeia.

22. ℞. Zinci sulphatis, ... 0|25 gm. (gr. iij)
Aquæ destillatæ, ... 25|0 c.c. (f℥ vj et ♏xxv).
(Hirschberg.)

Solutions of sulphate of zinc readily become contaminated.

Plumbi Acetas.—Only the neutral salt of acetate of lead in one to two per cent. solutions should be used for penciling. For compresses, liquor plumbi subacetatis may be employed in solutions of from five to ten drops to a teacupful of boiled water. These astringents are indicated in diseases of the conjunctiva and the tear passages. They are contra-indicated where there are abrasions of the corneal epithelium. In general, however, lead washes are employed much too frequently in practice, their value not being so great as is supposed. The cause of their frequent use may be due to the lack of proper substitutes.

Cupri Sulphas.—Sulphate of copper is used in substance as a pencil, in the form of an ointment, and in a water or glycerine solution for instillation purposes. Combined with neutral acetate of lead, it forms an aluminated copper. It is indicated in trachoma. As a rule, it is employed when the secretions from the conjunctiva are scanty or are wanting, while nitrate of silver in solution can, on the other hand, be used when there is an excessive secretion.

23. ℞. Cupri sulphatis, . 0|05 ad 0|15 gm. (gr. $\frac{1}{10}$ ad gr. ij)
Vaselini albæ (American), 5|0 gm. (℥j et gr. xvij).

24. ℞. Cupri sulphatis, 0|025 ad 0|5 gm. (gr. $\frac{3}{10}^{+}$ ad gr. vij)
Unguenti glycerini, . . . 10|0 gm. (℥ iiss).

25. ℞. Cupri sulphatis, ... 0|25 gm. (gr. iij)
Cocain hydrochloratæ, . 0|25 gm. (gr. iij)
Unguenti glycerini, . . . 10|0 gm. (ʒiiss).
Misce et fiat unguentum.
SIGNA.—Ointment for the eye.

The copper stick is only adapted for use by the physician himself. At first it should be employed every two or three days; later it must be used less frequently. There are many patients, however, who cannot tolerate the frequent application of the copper stick. It is, therefore, at times advisable, before using it, to cocainize the conjunctival membrane of the everted upper lid. Cocaine may be also added to the copper ointment, which later should be employed in two per cent. strength for daily use. Fifteen minutes after the use of the ointment the patient is to be directed to wash the eye and then to apply cold compresses.

Alumen.—As a rule, alum is only employed in the form of the pencil. It is milder than copper. Although the author has found it in use in several clinics in the treatment of trachoma, yet a number of writers consider it ineffective.

Tannin.—This drug is rarely employed, though in the clinics of Vienna it is sometimes used for instillation (Königstein).

Sodium Biboras.—One to two per cent. solutions of biborate of soda are mild in their action and should be employed in the form of instillation.

26. ℞. Sodii biboratis, ... 0|3 gm. (gr. iv)
Aquæ destillatæ, ... 20|0 c.c. (fʒv).
Misce et
SIGNA.—To be dropped into the eye twice daily.

By some it is employed in the treatment of phlyctenular diseases; by others it is less frequently used in simple conjunctivitis. Förster[1] and Greeff[2] recommend it for instillation in two per cent. strength solutions.

The Mercury Preparations.—The representative preparations are oxide of mercury and calomel. The former is best known in the form of hydrargyri oxidum flavus, constituting the chief ingredient in Pagenstecher's ointment. The variations in the formula employed are mostly in the character of the base that is used. Yellow ointment is very frequently prescribed in acute ciliary blepharitis, but it is not always well borne, and not infrequently it increases the redness of the palpebral edges.

In the use of calomel it is to be observed that the powder should be kept dry, because, under the influence of moisture, it is apt to become lumpy.

Contraindications.—During the simultaneous use of iodide of potassium internally, the conjunctiva can become irritated through the formation of mercuric iodide. According to Hirschberg, no irritation occurs when several hours have elapsed between the administration of the iodine preparation and the insufflation of the calomel into the eye, this being so by reason of the rapid elimination of the potassium salt. When a teaspoonful of iodide of potassium solution, five to two hundred and fifty strength, or a teaspoonful of syrup of the iodide of iron, ten to

[1] "Breslauer ärtzliche Zeitschrift," 1888, S. 1.

[2] "Archiv für Augenheilkunde," Bd. xiv, S. 60.

fifty per cent. in strength, is ingested immediately before the application of the powder, lacrimation and irritation of the conjunctiva are soon produced. Under these circumstances the little calomel speck on the conjunctiva becomes bluish. Calomel is further contraindicated in irritative conditions of the cornea.

It may be wise at this place to give the most common formulæ of the antiseptic and mercurial preparations, as otherwise they would have to be too frequently repeated in the special part.

FORMULÆ FOR ANTISEPTICS AND PREPARATIONS OF MERCURY.

27. ℞. Solutionis hydrargyri chloridi corrosivi (1 : 2000 to 1 : 10,000), ... 150|0 c.c. (f℥iv et f℥vj).
SIGNA.—Wash for eye-bandages.

28. ℞. Solutionis hydrargyri oxycyanatis (1 : 2000 to 1 : 1000), . 150|0 c.c. (f℥iv et f℥vj).
SIGNA.—Eye-wash.

29. ℞. Hydrargyri chloridi corrosivi, . 0|04 gm. (gr. $\frac{6}{10}$)
Aquæ destillatæ, ... 200|0 c.c. (f℥vj et f℥iij).

30. ℞. Hydrargyri chloridi corrosivi, 0|003 gm. (gr. $\frac{4\frac{1}{2}}{10}$)
Vaselini albæ (American), . . 10|0 gm. (℥iiss).
SIGNA.—Eye-ointment. (Michel.)

31. ℞. Hydrargyri oxycyanatis, . . . 1|0 gm. (gr. xvss)
Aquæ destillatæ, ... 500|0 c.c. (Oj).
Misce et fiat in collyrium.
SIGNA.—Eye-wash for blennorrhea. (Schlösser.)

32. ℞. Unguenti hydrargyri cinerei,[1] . 15|0 gm. (℥iv)
Vaselini albæ (American), . . 30|0 gm. (℥j)
Lanolini purissæ (Liebreich), 15|0 gm. (℥iv).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

[1] German Pharmacopeia.

33. ℞. Hydrargyri biiodati,[1] . . . . 0|3 gm. (gr. ivss)
Potassii iodati,[1] . . . . . 3|0 gm. (gr. xlvj)
Aquæ destillatæ, ... 30|0 c.c. (f℥j).
Misce et
SIGNA.—Eye-drops. Five drops three times daily. (Von Graefe.)

34. ℞. Hydrargyri chloridi corrosivi, . 0|2 gm. (gr. iij)
Sodii chloratis,[1] . . . . . 2|0 gm. (gr. xxx)
Aquæ destillatæ, ... 20|0 c.c. (f℥v).
Misce et
SIGNA.—To be used for injection. (Schmidt-Rimpler.)

35. ℞. Hydrargyri biiodati,[1] . . . . 0|15 gm. (gr. ij)
Potassii iodati,[1] . . . . . 1|5 gm. (gr. xxiij).
Misce et fiat in pilulæ, No. xxx.
SIGNA.—Two to three pills daily. (Hirschberg.)

36. ℞. Hydrargyri chloridi corrosivi, 0|15 gm. (gr. ij)
Aquæ destillatæ, q. s.
Misce et fiat in pilulæ No. xxx.
SIGNA.—Two pills daily.

37. ℞. Hydrargyri chloridi corrosivi, 0|05 gm. (gr. $\frac{7}{10}$)
Argillæ,[1] . . . . . 3|0 gm. (gr. xlvj)
Aquæ destillatæ, q. s.
Misce et fiat in pilulæ No. xxx.
SIGNA.—Two pills daily.

38. ℞. Hydrargyri oxidi flavi, . . . 0|2 gm. (gr. iij)
Vaselini albæ (American), . . 10|0 c.c. (℥iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

39. ℞. Hydrargyri oxidi flavi, . . . 0|05 ad 0|1 gm. (gr. $\frac{7}{10}$–iss)
Unguenti aquæ rosæ, ... 5|0 gm. (℥j et gr. xvij).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

40. ℞. Hydrargyri oxidi flavi, . . . 0|1 gm. (gr. iss)
Unguenti paraffini, ... 5|0 gm. (℥j et gr. xvij).
(Olei amygdalæ, gtt. iij). (Fischer.)

41. ℞. Hydrargyri oxidi flavi, . . . 0|1 gm. (gr. j)
Unguenti glycerinæ,[1] . . . . 5|0 gm. (℥j et gr. xvij).

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[1] German Pharmacopeia.

42. ℞. Hydrargyri oxidi flavi, . . . 0|2 gm. (gr. iij)
Unguenti paraffini, ... 5|0 gm. (ʒj et gr. xvij).
(Schmidt-Rimpler.)

43. ℞. Hydrargyri oxidi flavi, . . . 0|1 gm. (gr. iss)
Unguenti anglicæ flavi,[1] . . . 5|0 gm. (ʒj et gr. xvij).
Misce et fiat in unguentum.
SIGNA.—Eye-salve. (Nieden.)

44. ℞. Hydrargyri oxidi flavi, . . . 0|1 gm. (gr. iss)
Lanolini purissæ (Liebreich), . 6|0 gm. (ʒiss)
Vaselini albæ (American), . . 3|0 gm. (gr. xlv).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

The watery solutions of bichloride of mercury have an acid reaction, but they become neutral upon the addition of common table salt. This is probably the *rationale* for the addition of sodium chloride to the formulæ for mercuric chloride.

In the use of mercurial ointments the directions should be to employ a definitely weighed amount, or a quantity that is equal to the size of a hemp seed or a lentil, one or twice daily, according to the nature of the case.

45. ℞. Hydrargyri biiodati,[1] . . . . 0|25 gm. (gr. iv)
Potassii iodati,[1] . . . . . 2|5 gm. (gr. xxxviij)
Aquæ destillatæ, ... 10|0 c.c. (fʒiiss)
Syrupi simplicis, ... 50|0 c.c. (fʒj et fʒiss).
Misce et
SIGNA.—Teaspoonful three times daily, or as directed. (von Graefe.)

46. ℞. Formaldehyd puræ, ... 10|0 c.c. (fʒijss).
Misce et
SIGNA.—Ten drops in one liter (Oij) of water. To be used as an eye-wash. (Valude.)

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[1] German Pharmacopeia.

3. OINTMENTS.

The ointment most frequently used in ophthalmology is that of the yellow oxide of mercury. It is more finely divided and is milder in action than the red oxide of the same metal.

Pagenstecher, who introduced this drug into ophthalmic practice (hence the name Pagenstecher's Ointment), at first employed the remedy in the strengths of from ten to twelve per cent., while Saemisch learned to use it in five to seven per cent. strengths. At present it is used in but from two to four per cent. In phlyctenular catarrh Hirschberg employs it in the strength of one per cent. The bases for the ointments are numerous. Cold cream, paraffine ointment, with the addition of two drops of almond oil to the gram (gr. xv),[1] and vaseline are all employed. Cold cream has the disadvantage that it rapidly destroys the yellow color of the ointment. Paraffine ointment (a white, odorless, non-decomposable mass, consisting of four parts of liquid paraffine and one part of solid paraffine (Schmidt-Rimpler))[2] is better, though Hirschberg considers it too hard. Of the same rank with this preparation is American vaseline. It is not a paraffine preparation, but is an absolutely pure vaseline.

The difference between the two is that paraffine is

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[1] Fischer, "Unsere gelbe Salbe," "Centralblatt für praktische Augenheilkunde," 1894, S. 80.

[2] "Augenheilkunde," S. 17.

obtained by the dry distillation of lignite and coal, and is identical with belmontin, prepared from rock oil, petroleum, and ozokerite (the so-called miner's). In their pure state they present no differences: they are white, resembling white wax, have a greasy feel, are tasteless, odorless, and are not acted upon by alkalies or acids with the exception of nitric acid. The German yellow vaseline is not very good for use as an ointment base, as it is but slightly hygroscopic. It is obtained from the residues in the distillation of petroleum.

The American yellow vaseline takes up considerably more water than the German and may be drawn into long threads, while the German breaks off short. The advantage of the base being hygroscopic is seen, for example, in the preparation of ointments of iodide potassium. Paraffine ointment will scarcely take up any water.

Glycerine ointment is less to be recommended (Schmidt-Rimpler) as an ointment base because it is too tenacious and too stringy. An ointment composed of yellow wax, cold cream, and almond oil (Unguentum anglica flavus) is also employed. Lanolin alone is somewhat irritating to the conjunctiva (Hirschberg) and is usually combined with American vaseline. In a brief notice Fischer[1] confirms the foregoing statements. He mentions, however, only the yellow American vaseline, and not the white, which is preferable.

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[1] "Centralblatt für praktische Augenheilkunde," 1895, June, S. 191.

To the antiseptic agents should also be added the aniline dyes which were introduced into ophthalmic practice by O. Stilling in 1890. Pyoctanin, as the chief representative, is said to possess, in the form of a pencil or solutions, a marked antimycotic action in the infectious processes of the conjunctiva and the cornea. Professional opinion regarding this, however, is divided. From the rich literature on the subject it will suffice to abstract a few of the more recent articles. Stilling[1] maintains that the aniline dyes, when properly employed, possess an antiseptic action in corneal ulcers. This opinion is confirmed by Meyer and Panas.

The German ophthalmologists, however, take an opposite view. Scheffels[2] cautions even against the yellow pyoctanin stick, claiming to have observed ill effects from its employment. He states that he has not obtained any success with pyoctanin in the eye-clinics of Wiesbaden.

In Italy,[3] the verdict is that the aniline dyes do not give any better results than other antiseptic agents, although in a single case of purulent dacryocystitis, with caries, a striking improvement was obtained.

3. ALKALOIDS.

Under this collective name remedies which, by reason of the peculiarity of their action, occupy an

[1] "Deutsche medizinische Wochenschrift," 1893, Nr. 10.

[2] "Berliner klinische Wochenschrift," 1890, 98.

[3] "Centralblatt für praktische Augenheilkunde," 1891, S. 478. Reference originally from the "Gazzetta degli ospedali," 1890, Juni.

exceptionally important position in ophthalmic practice will be briefly considered. Cocaine will be discussed at length in a later chapter.

(*a*) **Mydriatics.**—Atropine (isomeric with daturine) is the alkaloid of *atropa belladonna*, and is isomeric with an alkaloid that is obtained from the seeds of the *Datura stramonium*. In its preparation, it is first extracted with acidulated water, the residue, after evaporation of the water, being alkalized with sodium hydrate. It is then shaken with ether and dissolved. After volatilization of the ether, the atropine which remains is dissolved in dilute sulphuric acid, and, lastly, it is purified with animal charcoal and alcohol. Atropine is the salt of an organic base, tropin, containing the hydroxyl group and tropic acid belonging to the aromatic compounds.

The chief effects of the alkaloid upon the eye consists in a paralysis of the sphincter pupillæ muscle, a palsy of the ciliary muscle, and a simultaneous stimulation of the dilator pupillæ. When used, it should be noted whether the patient complains of a dryness of the throat and vertigo. The pulse may become frequent, and at times a scarlatiniform eruption may appear. Delirium may also occur. In fatal cases that have been occasionally observed (usually children that have drank from a vial containing a solution of the drug) palsy of the tongue, convulsions, delirium, stupor, frothing at the mouth, and cessation of the respiratory power have been the phenomena observed. In other cases of general intoxication with the drug, difficulty

in deglutition, intense thirst, nausea, vertigo, muscular unrest, general muscular spasms, and delirium similar to that found in alcoholic intoxication, have been noted. The eyes are held widely open and are staring, the conjunctivæ are injected, violent convulsions occur, and finally, stupor, coma, and death successively appear.

In little children the symptoms of absorption, according to Königstein, are restlessness and flushing of the face with acceleration of the pulse and increased respiration.

Treatment of Atropine-poisoning.—Morphine[1] by hypodermatic injections is the foremost antidote. While these are being prepared, emetics, milk, oil, and vinegar should be administered. Eserine in doses of 0.003 gm. (gr. $\frac{1}{20}$) hypodermatically has also been recommended for the purpose of counteracting cardiac paralysis. Foot-baths of mustard and vinegar should be given.

The maximum dose for instillation into the adult eye is given by Michel as six to eight drops of a one-half per cent. strength solution. In recent, severe, and acute cases of iritis, Hirschberg employs the drug every hour or two on the first day. Whether he uses it in one-half or one per cent. strength solution, he fails to state. From the second day onward he instils it into the eye every second or third hour. In grave cases he uses it also at night.

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[1] Morphine can be used subcutaneously up to 0.03 gm. (gr. ss). Pilocarpine to 0.02 gm. (gr. $\frac{1}{3}$) and eserine, 0.001 gm. (gr. $\frac{1}{60}$), may also be employed.

Fuchs advises that a piece of linen be held under the eye during the instillation. Schweigger employs atropine in one per cent. strength solution.

Atropine is the chief remedy in iritis, keratitis, and scleritis. It acts more favorably when employed warm or when its use is preceded by warm applications. In cases of severe irritation, combinations of atropine and cocaine are of value.

The effects consist in the paralysis of the sphincter pupillæ muscle and the rendering of the tissues of the iris more anemic. It also prevents the formation of synechiæ and lessens the sensibility of the corneal nerve-endings, for which latter reason it is frequently combined with cocaine.

The drug is contraindicated in glaucoma and in conditions favoring the development of the condition. If the deeper veins are well filled with blood, producing a peculiar dark redness of the sclerotic coat, and if there is a dilated pupil, which perhaps may be oval in outline, it is probable that a glaucomatous condition is present. If, however, a patient presents himself with an inflamed eye, in which there are circumcorneal injection and irritation, with posterior synechiæ, as determined by oblique illumination, atropine may, as a rule, be used. The acuity of vision and the visual field should be taken into consideration. In cases of total posterior synechiæ the use of atropine is prohibited.

In small corneal lesions atropine is unnecessary. Fuchs states that in recent cases of posterior synechiæ the effort may be made to loosen them by intro-

ducing a crystal of the drug into the conjunctival sac, the lacrimal sac at the same time being compressed. Caution is, however, necessary in this procedure, on account of danger of general intoxication. The drug should not be employed in cases in which an idiosyncrasy exists. This type, however, can only be assumed to exist when irritation appears after the first instillation, and recurs after each succeeding trial.

The atropine conjunctivitis which is occasionally observed is attributed by Hirschberg to the use of contaminated solutions, or to the too-long-continued employment of the remedy, with the lack of proper care. The symptoms are lacrimation and conjunctival irritation. Treatment consists in the employment of compresses of cold chlorine-water, with the application of nitrate of silver in one per cent. strength solutions.

If, during the prolonged use of the drug, dryness in the throat is complained of, the remedy may be employed in the form of an ointment. In the use of solutions it should be remembered that in some cases those containing bichloride of mercury of one to five thousand or one to ten thousand strength are the best.

Recently, another mydriatic has acquired a great reputation—first, because, notwithstanding the dilatation of the pupil occasioned, it is said not to cause an increase of intraocular tension; and, second, because its cycloplegic effects far surpass those of atropine. This new agent is known as *scopolam-*

inum hydrobromicum.[1] In reality, it is said to be nothing else than hyoscine,[1] because conversely, although it is the alkaloid of scopolia atropoïdes, yet hyoscine preparations of commerce improperly consist of nothing but scopolamine. Nevertheless, clinically it should be used only in one-tenth or one-fifth the dose of atropine—namely, in solutions of strengths of one to one thousand or one to five hundred.

It is five to ten times more active than atropine, but in contradistinction to this drug, it is said to have no influence upon intraocular tension.[2] The time required to produce its cycloplegic action is briefer, and, on account of the greater dilution, the conjunctival membrane is not irritated.[3] The duration of the pupillary dilatation is only about four to seven days, as against ten to twelve days for atropine. Immediately after the publication of Lewin's[4] remark that hydrobromate of hyoscine is termed hydrobromate of scopolamine, it was asserted that the latter drug is a mixture of the two bases—hyoscine and atropine.

Hyoscine.—Although it is apparent from the preceding that the two alkaloids scopolamine and hyoscine are probably identical, it may yet not be out of place to note what has been said in literature concerning the latter. It is isomeric with atropine,—*i. e.*, it

[1] Hirschberg, "Centralblatt für praktische Augenheilkunde," June, 1893.

[2] "Illig. Münchener medizinische Wochenschrift," 1893, 33.

[3] "Centralblatt für praktische Augenheilkunde," 1893, S. 500.

[4] "Deutsche medicinische Wochenschrift," 1895, April 25, S. 269.

possesses the same percentage of composition, differing, however, in its physiological properties. Hyoscine is much the more poisonous. It occurs associated with hyoscyamine in henbane. It forms yellow prisms.[1] The symptoms of poisoning are headache, vertigo, vomiting, dilatation of the pupils, muscular weakness, drowsiness, delirium, and death.

Michel cautions against its employment for purposes of instillation; Hirschberg states that within from ten to twenty minutes after its use disturbance of speech, confusion, vertigo, hebetude, and a staggering gait may ensue. Although these symptoms rapidly disappear, yet it would be unwise to permit a patient so affected to go out on the street soon after the use of the remedy. In children, he says, it is absolutely contraindicated. Under the use of one-half per cent. strength solution the general symptoms described above do not occur. According to Königstein, a solution of one to one thousand strength is sufficiently strong for ophthalmic practice.

It should be stated that (according to the most recent researches of Schmidt[2] and Merck[3]) there is no doubt that the alkaloid prepared by Merck and introduced into commerce under the name of hyoscine (Merck, of Darmstadt, and Ladenburg, of Kiel)[4] is identical with scopolamine ($C_{17}H_{23}NO_3$).

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[1] Peters, "Centralblatt für praktische Augenheilkunde," 1893, S. 500.

[2] "Archiv der Pharmacie," 1894, S. 409.

[3] E. Merck, Darmstadt, "Bericht über das Jahr 1894," S. 93; (1893), S. 78.

[4] "Klinische Monatsblätter für Augenheilkunde," 1893, S. 59.

If, notwithstanding this, the name is retained, it is only to avoid error and to indicate the origin, hyoscine being the alkaloid prepared from hyoscyamus, and scopolamine the one that is obtained from the roots of a species of *Scopolia*.

In use there are two forms of salt—hydrochlorate of scopolamine, introduced by Rählmann ($C_{17}H_{23}NO_3HCl_3$), and hydrobromate of scopolamine, brought out by Merck ($C_{17}H_{21}NO_4HBr. + 3H_2O$).

Although Merck has demonstrated the identity of the two alkaloids, Rählmann (1893, *ibidem*) states that scopolamine does not produce the unpleasant secondary effects seen after the use of hyoscine. He ranks the local anodyne and antiphlogistic actions of scopolamine above those that are obtained by atropine. Especially has he found this so in purulent processes of the anterior part of the globe, such as suppurative keratitis, rodent ulcer, and iridocyclitis. Used in large doses, it does not, like atropine, accelerate the heart's action, but slows it. Above all, it does not produce any increase of intraocular tension, and is, therefore, to be recommended in iritis and in some glaucomatic conditions (secondary glaucoma). This, however, has recently been disputed. In addition to its action as a mydriatic it produces paralysis of the accommodation.

The assertion that under its use an increase in tension need not be feared requires further confirmation. In a case of glaucoma, Walter[1] ob-

[1] "Klinische Monatsblätter für Augenheilkunde," 1893, S. 59.

served a glaucomatous exacerbation during its employment.

The bromide salt forms transparent, tablet-shaped rhombic crystals which are readily soluble in water, but less so in alcohol.

A not so frequently used and not so well known alkaloid is *ephedrine*. It is derived from *Ephedra vulgaris*, of the order of Gnetaceæ, and is found in Southern Europe and Northern Africa. Hydrochlorate of ephedrine crystallizes in colorless needles which are readily soluble in water, but only with difficulty in alcohol.

Kinnosuke Miura, of Tokyo, reports as follows concerning this alkaloid: One or two drops of a ten per cent. strength solution of a preparation made by Professor Nagai produces mydriasis in from forty to sixty minutes' time. The accommodation is not paralyzed. In irritative conditions of the iris mydriasis does not occur. The dilatation persists for from five to twenty hours. No increase of tension is produced.

Recently Professor Geppert (Breslau) has made some experiments with a combination of small doses of the drug in combination with homatropine, and has obtained thereby a marked increase of the mydriasis, the dilatation, moreover, being of brief duration. Such properties make a combination of the two drugs of great value in producing pupillary dilatation, and for this reason Merck[1] has given the

[1] E. Merck, vorläufige Mittheilung, März, 1895, Nr. 119.

name of *mydrin* to it. Groenouw[1] confirms what has been said, and employs the remedy for diagnostic purposes, as well as for the determination of refraction. The formula he uses is—

47. ℞. Ephedrin hydrochloratis, 1.0 to 0.5 gm. (gr. vij)
Homatropin, ... 0.01 to 0.005 gm. (gr. $\frac{7}{100}$)
Aquæ destillatæ, ... 10.0 c.c. (f℥iiss).

The mydriasis remains at its height for about a half an hour, beginning a few minutes after instillation. In the course of about an hour it disappears. The pupillary dilatation is marked, but is not maximal, which in reality is an advantage when it is produced for diagnostic purposes only.

In France[2] a mixture of several alkaloids has for some time been used. Thus atropine, duboisine, and cocaine have been combined and furnish a mydriatic that is unequaled by any other agent, and without danger of intoxication. Likewise, a very active miosis is obtained by the combination of eserine and pilocarpine. A combination of cocaine and pilocarpine is also said to prevent the mydriasis and disturbance of accommodation (?) produced by cocaine, without influencing the anesthetic power of the latter drug.

Homatropine, $C_{16}H_{21}NO_3$.—This alkaloid is weaker in its action than most all of the other mydriatics. It is generally used in the form of the hydrobromate. Just as atropine, which is composed of tropin and

[1] Groenouw, "Deutsche medicinische Wochenschrift," 1895, 7. März, Nr. 10.

[2] "Centralblatt für praktische Augenheilkunde," 1893, S. 532.

tropic acid, into which it can be separated by treating it with baryta ; so homatropine, in a similar manner, is composed of tropin and mandelic acid, which resembles tropic acid. It is, therefore, the mandelic ether of tropin, $C_8H_{14}NOCo.,C_7H_7O$. Professor Ladenburg (Kiel) has had the honor of having prepared it synthetically. Its value consists in the brief duration of the mydriasis produced by it, the rule being that, while that caused by atropine lasts from ten to twelve days' time, that following the use of homatropine lasts but from six to twenty-four hours' time. On this peculiarity depends its usefulness for diagnostic purposes. The mydriasis, which can readily be overcome by means of eserine, begins in a half an hour's time. Like all mydriatics, however, this remedy has been found to do harm in glaucomatic cases. For ordinary diagnostic uses it is preferable to cocaine in two per cent. strength solutions. Employed in this strength, it also dilates the pupil. In some cases homatropine is useful for the examination of refractive conditions.

Daturine, the alkaloid of the thorn-apple, is identical with atropine, and has the same properties.

Duboisine is the alkaloid of duboisia, a scophulariaceous plant of Australia—the *Duboisia hopwoodii*, or pituri-plant, of New South Wales and Queensland. The twigs, which are chewed by the natives as a stimulant, contain the pituri-poison.

Duboisia myoporoides, of East Australia and New Caledonia, contains duboisine. This alkaloid is a brownish, hygroscopic, alkaline substance that is sol-

uble with difficulty in water, although it is readily soluble in alcohol and in ether. While it produces mydriasis and paralysis of the accommodation, it surpasses atropine in its promptness of action. For this reason, and perhaps also because its effects last but about five days, it is preferred by some. According to Merck, duboisine is from two to three times more powerful than atropine. This manufacturer prepares it in the form of the hydrochlorate. The recent studies of Vierling[1] confirm the statement that the mydriasis appears more quickly than in the case of the other mydriatics. The same author, however, has not made any experiments with mydrin.

(*b*) **Miotics.**—Only two miotics are in common use—physostigmine or eserine, and pilocarpine. The sulphate of eserine in fresh solutions is supposed to act more powerfully than the salicylate. It is also said to produce more discomfort.[2] Eserine is a white, crystalline, deliquescent powder, the alkaloid of *Physostigma venenosum* ($C_{15}H_{21}N_3O_2$). Under the action of light and air it decomposes and becomes red, and should, therefore, be preserved in sealed glass tubes and kept in a cool place.

Eserine produces not only contraction of the sphincter pupillæ with consequent miosis, but also increases the power of accommodation, separating both the near and the far points. In addition, it produces a reduction in intra-ocular tension, on which

[1] "Beiträge zur Augenheilkunde," Hefte XIII, 1894.

[2] "Centralblatt für praktische Augenheilkunde," 1892, S. 542.

account the drug is indispensable in the treatment of glaucoma. The slight increase in pressure occurring in the beginning of its action is very transient, its chief effect being the after-reduction in tension. According to Michel, the cause of the decrease in tension is that the drug facilitates the venous outflow by stretching the iris, while atropine, on the contrary, increases tension by impeding the venous return.

As a rule, eserine produces a burning sensation and at times it is the cause of a drawing character of headache. The full effect of a one-half to one per cent. strength solution of the drug is produced in from thirty to forty minutes' time, persisting for about an hour. The spasm of the iris then gradually relaxes, but the miosis may at times last for days. Königstein states that when large quantities of the drug are instilled, the pain may assume the character of a supra orbital neuralgia, and that vomiting may also occur.

Pilocarpine hydrochlorate, an alkaloid of jaborandi, has a similar, though milder, effect than eserine. It is employed in solutions of from one to five per cent. strength.

Aside from its use in glaucoma, eserine is indicated in corneal ulcers that are situated peripherally and are threatening to perforate, so as to prevent anterior synechiæ. The drug is said to be useful for diagnostic purposes in astigmatism, in order, it is asserted, to lessen diffusion circles and thus to increase visual power ; however, any sten-

opeic slit can do this much more quickly. The eserine gelatin lamellæ introduced into commerce have not obtained much recognition. The general symptoms of eserine poisoning are headache, vertigo, and vomiting.

FORMULÆ FOR MYDRIATICS AND MIOTICS.

48. ℞. Atropinæ sulphatis, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. One drop in each eye twice daily. (Schweigger.)

49. ℞. Atropinæ sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Sodii chloridi, ... 0|01 gm. (gr. $\frac{3}{20}$)
Hydrargyri chloridi corrosivi, 0|002 gm. (gr. $\frac{3}{1000}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. One drop in each eye twice daily. (Schmidt-Rimpler.)

50. ℞. Atropinæ sulphatis, ... 0|1 gm. (gr. iss)
Aquæ sublimatis (1 : 5000), . 10|0 c.c. (f℥iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. (Hirschberg.)

51. ℞. Atropinæ sulphatis, ... 0|025 gm. (gr. $\frac{3}{10}$)
Sodii chloridi, ... 0|005 gm. (gr. $\frac{7}{1000}$)
Hydrargyri chloridi corrosivi, 0|001 gm. (gr. $\frac{1}{1000}$)
Aquæ destillatæ, ... 5|0 c.c. (f℥i¼).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops.

52. ℞. Extracti hyoscyami, ... 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. (Schweigger.)

53. ℞. Atropinæ sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Vaselini albæ (American), . . 5|0 gm. (℥i¼).
Misce et fiat in unguentum.
SIGNA.—Poison. Eye-salve. (Schöler-Michel.)

54. ℞. Cocainæ hydrochloratis, . . . 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 5|0 c.c. (f℥ i¼).
(Or aquæ sublimatis, 1 : 5000).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops.

55. ℞. Cocainæ hydrochloratis, . . . 0|1 gm. (gr. iss)
Atropinæ sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ sublimatis (1 : 5000), . 5|0 c.c. (f℥ i¼).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. For severe pain.

56. ℞. Homatropinæ hydrobromatis, . 0|025 gm. (gr. $\frac{5}{10}$)
Aquæ destillatæ, ... 2|5 c.c. (f℥ ss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops.

57. ℞. Homatropinæ hydrochloratis, 0|1 gm. (gr. iss)
Hydrargyri chloridi corrosivi, 0|002 gm. (gr. $\frac{3}{1000}$)
Sodii chloridi, ... 0|01 gm. (gr. $\frac{3}{20}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. (Schmidt-Rimpler.)

58. ℞. Hyoscinæ sulphatis (Schering), 0|02 gm. (gr. $\frac{3}{10}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops.

59. ℞. Duboisinæ sulphatis, ... 0|01 gm. (gr. $\frac{3}{20}$)
Aquæ destillatæ, ... 3|0 c.c. (mxlvj).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops.

60. ℞. Ephedrinæ hydrochloratis, 0|5 –1|0 gm. (gr. viiss–xv)
Homatropinæ hydrochloratis, 0|005–0|01 gm. (gr. $\frac{7}{1000}$–iss)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. (Groenouw.)

61. ℞. Scopolamini hydrobromici, 0|005–0|01 gm. (gr. $\frac{7}{1000}$–iss)
Aquæ destillatæ, ... 5|0 c.c. (f℥ i¼)
(Or aquæ sublimatis, 1 : 5000).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. (Rählmann.)

62. ℞. Scopolamini hydrobromici, . 0|01–0|02 gm. (gr. $\frac{3}{20}$–$\frac{3}{10}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss)
(Add solutionis formaldehydi, $\frac{1}{10}$%, gtt. j).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. Six or seven drops daily. (Merck.)

63. ℞. Hyoscini hydrobromatis, . . 0|01 gm. (gr. $\frac{3}{20}$)
Vaselini albæ (American), . . 5|0 gm. (℥ i¼).
Misce et fiat in unguentum.
SIGNA.—Poison. Eye-salve.

64. ℞. Atropinæ sulphatis, ... 0|03 gm. (gr. $\frac{3}{5}$)
Aquæ destillatæ, ... 6|0 c.c. (f℥ iss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. (Königstein.)

65. ℞. Cocainæ hydrochloratis, . . 0|1–0|25 gm. (gr. iss–iij)
Vaselini albæ (American), . . 3|0 gm. (℥ ¾).
Misce et fiat in unguentum.
SIGNA.—Poison. Eye-ointment. (Königstein.)

66. ℞. Sodii sozoiodol,[1] . . . . . 0|25–0|5 gm. (gr. iij–vij)
Atropinæ sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Vaselini, ... 10|0 gm. (℥ iiss).
Misce et fiat in unguentum.
SIGNA.—Poison. Eye-ointment. Use one to three times daily.

67. ℞. Cocainæ hydrochloratis, . . . 0|05 gm. (gr. $\frac{7}{10}$)
Vaselini albæ (American), . . 5|0 gm. (℥ i¼).
Misce et fiat in unguentum.
SIGNA.—Poison. Eye-salve. (Hirschberg.)

68. ℞. Lamellæ eserinæ sulphatis, . . $\frac{1}{25}$ mg. (gr. $\frac{3}{500}$).
(Divide into doses no. vi.)
SIGNA.—Poison. Eserine. For the eye.

69. ℞. Lamellæ atropinæ sulphatis, . $\frac{1}{25}$ mg. (gr. $\frac{3}{500}$).
(Divide into doses no. vi.)
SIGNA.—Poison. Atropine. For the eye.

70. ℞. Physostigmæ salicylatis, . . . 0|05 gm. (gr. $\frac{7}{10}$)
Hydrargyri chloridi corrosivi, . 0|002 gm. (gr. $\frac{3}{1000}$)
Sodii chloridi, ... 0|01 gm. (gr. $\frac{3}{20}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. (Schmidt-Rimpler.)

[1] German Pharmacopeia.

71. ℞. Pilocarpinæ hydrochloratis, . 0|2 gm. (gr. iij)
Sodii chloridi, ... 0|01 gm. (gr. $\frac{3}{20}$)
Hydrargyri chloridi corrosivi, . 0|002 gm. (gr. $\frac{3}{100}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat in collyrium.
SIGNA.—Poison. Eye-drops. (Schmidt-Rimpler.)

Watery solutions of the alkaloids become rapidly turbid and yellowish during the summer months, while those which have been prepared with one to five thousand strength of bichloride of mercury remain clear and pure for several months' time.

4. NARCOTICS AND LOCAL ANESTHETICS.

In this section general sedatives—morphine, chloral, sulphonal, etc.—as well as local sedatives, such as cocaine, and finally narcotics, will be considered.

Regarding the first class, all that need be said is that they should be used according to general medical principles. If it is desired not to employ morphine, sulphonal will, according to Hirschberg, prove a useful hypnotic. It should be given in two capsules of one gram (gr. xv) strength each, a few hours before bedtime. The maximum dose is four grams (℥j).

Cocaine (see formulæ numbers 54, 55, 65, and 67).—On account of its anesthetic properties, although it belongs to the alkaloids, cocaine ($C_{17}H_{21}NO_4$), the alkaloid of coca-leaves, will be considered here. It is so well known that but little need

be said of it, thus necessitating a mere reference to a few of its special conditions of action.

One of its chief actions, which, of course, ordinarily is not desirable, is the drying of the corneal surface, dependent in measure upon the lessening of the act of closing the eyelids. To this may be added, that a large part of the corneal area is exposed to the influence of the air, this being produced by an enlargement of the palpebral fissure caused by stimulation of the smooth muscle-fibers contained in the levator palpebrarum. This result, therefore, is not without a harmful influence upon the corneal epithelium. Indeed, it may lead to exfoliation of the superficial layers, producing the so-called *cocaine-keratitis* of Michel. As he says, "A cocainized eye should, therefore, be always covered by a moist compress, especially in the case of peasants who have long distances to travel." Moreover, it should be remembered that, as in the case of atropine, a glaucomatous attack may be induced by the action of the drug in cases that are so predisposed. The symptoms of poisoning from the subcutaneous injection of the drug are: "thick speech," unsteady swaying gait, vomiting, and cold perspiration. Injected subcutaneously into the lid, it may produce an edematous swelling, rendering such a method of employment inadvisable.

For use in operative work, most physicians use two per cent. strength solutions. Some ophthalmologists, such as Fick and Fuchs, employ it in five per cent. strengths. According to Hirschberg, the cor-

neal opacities seen after operations are not, as a rule, attributable to cocaine-keratitis, but are due to the reckless employment of corrosive sublimate solutions.

For diagnostic purposes, Schmidt-Rimpler recommends a four per cent. strength solution. Schweigger uses it in two per cent. solution strengths. Hirschberg prefers homatropine for the same purpose. In private practice, a two per cent. strength solution of the drug will, on the whole, be found satisfactory. As it is difficult to keep the solutions sterile, it is well to employ corrosive sublimate water in the strengths of one to five thousand or one to ten thousand as the menstruum to hold the drug in. Some authors prefer chlorine-water.

The mydriatic action of cocaine is only with difficulty produced in inflamed eyes. The effect of the drug is, therefore, more satisfactorily obtained in such conditions when it is employed in the form of an ointment. This observation is also true in the treatment of cases of blepharospasm.

The drug is also employed for the following purposes: Removal of foreign bodies from the cornea, preparation of part prior to treatment with the galvano-cautery, and in sounding of the lacrimal passages. When necessary to employ it in the form of subconjunctival injections, it should be used with caution, for fear of symptoms of poisoning, such as vomiting and cold sweat, these conditions having followed the employment of five drops of three per cent. strength solutions in this manner. The best

antidotes for the toxic effects of the drug are said to be amyl nitrite and ordinary wine.

A more recently introduced local anesthetic is *eucaine*. This drug was brought forward by Merling.[1] It differs from cocaine in that a methyl group is substituted in it for a hydrogen atom, which is formed by the action of ammonia upon acetone. According to Vinci, the physiological action of the drug is similar to that of cocaine, but it has advantages over the latter in that it has no effect on the pupil or on the accommodation, and that it is less poisonous. Furthermore, it has been found that solutions of eucaine are more permanent. Vinci believes that while the absence of the ischemic effects render the drug less suitable in some cases, in others its slight hyperemic action is distinctly advantageous. The hydrochlorate, in watery solutions of two per cent. strength, is the salt that is mostly employed in ophthalmic practice.

5. NARCOSIS.

Although it is not the author's intention here to discuss operations, yet occasions nevertheless arise in the treatment of ocular diseases, during which resort must be had to brief narcosis. For example, in children in the first years of life who have intraocular pathologic conditions that must be studied properly, general anesthesia becomes necessary.

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[1] "Deutsche Medizinal-Zeitung," Nr. 34.

For example, it should be employed in the diagnosis of glioma retinæ, and in protracted cases of blepharospasm, in which narcosis of brief duration is not only an advantage for purposes of diagnosis concerning the condition of the cornea, but where it has a distinctly beneficial action in that it facilitates the application of the remedies to be used. In such cases, the method becomes applicable.

For such purposes no anesthetic is as valuable as sulphuric ether. In such cases it is devoid of danger, and as there can be little or no fear of sudden death from this form of narcosis, the anesthetization can be readily undertaken without the aid of a second physician. For every published case of death from ether (pneumonia) where abnormal conditions are present, there are a dozen cases of published deaths from chloroform.

The following hints are important for quick narcosis with ether. The most practical method is that in which the ether-mask of Schweigger, that he has used for a number of years, is employed. It is nineteen centimeters broad at the oral end, twenty-three centimeters long, and is shaped like a cone. Every physician can have such a mask made at a trifling cost and trouble in his own house, and in such a way as to satisfy the most exacting demands of any surgeon holding the most extreme views upon asepsis and antisepsis. Some fresh absorbent cotton is to be placed loosely in the mask each time before it is used. In situations where the absorbent cotton is not attainable, a clean handkerchief, loosely rolled,

may be substituted and inserted into the cone. About a third or a half of fifty centigrams (f℥iss et f℥ss) of the anesthetic, according to the age of the patient, is to be poured into the mask. This, it will be seen, is in striking contrast to the method that is pursued when chloroform is used, in which the smallest dose is employed in the beginning. With ether, the mouth-opening of the mask is placed on the face so that it is held with the fingers of both hands firmly beneath the chin. It is also pressed against the sides of the nose and mouth. If this is not done, narcosis is not so rapid and not so uninterrupted. It is also especially important to do this for the first few respirations. If it becomes evident that there is a lack of air, the pressure with the fingers can be momentarily released. With this plan, a state of excitation, except in cases of alcoholic subjects, in whom to obtain general anesthesia is difficult, does not occur. On the whole, narcosis is chiefly used in ophthalmic practice among very young children. The only disagreeable feature that may arise in older children and in adults is an excessive salivation that soils the ether-mask.

Regarding vomiting, the same rules should act as a guide here as those which are employed in chloroformism—that is, the narcosis should not be begun after the patient has ingested a full meal.

Despite the fact that Silex[1] has published an important and exhaustive work concerning ether-nar-

[1] "Berliner klinische Wochenschrift," 1888.

cosis, it has not yet received proper attention, and has not been sufficiently adopted in private practice in Germany.

Infiltration anesthesia, first used in 1891 by Schleich and so favorably popularized in the United States of America by Würdemann, deserves special mention.

CHAPTER IV.

ELECTRICITY.

This agent as a therapeutic means has in various directions acquired an important place. In the decade beginning in 1870 it was chiefly employed, with but little success, in the form of the constant current, and seldom as the induced one; the faith placed in it being due to the *post hoc ergo propter hoc* reasoning. During the years 1880 to 1890 it was used in the more effective form of the galvano-cautery, which was introduced by Gayet. In the present decade, electrolysis has been added to its methods of application. The incandescent lamp with its reflector and a convex lens for artificial illumination have also been found useful.

Galvano-cauterization in its strict sense does not belong to electricity, since galvanism is simply used to heat the electrode—*i. e.*, it serves as a means to an end. The real agent is the incandescent wire, which can be prepared just as well with a Paquelin

cautery, or by the heating of a needle-point or the head of a sound in the flame of a spirit-lamp.[1] The practical demands are, as a rule, only satisfied when the electric current and the platinum loop are used.

The chief effect of the electric incandescent wire is witnessed in infectious ulcers of the cornea. It is to be remembered, however, that it is often necessary to employ the method two or three times, if after the first application improvement does not proceed satisfactorily. As an aid in the use of the galvano-cautery in ulcerative processes or in epithelial defects of the cornea, several writers (Groenouw,[2] Nieden [3]) have recommended fluorescine in two per cent. strength solutions as a staining agent, whereby, both as regards to superficial extent and depth, the limits of the healthy and the denuded portions of the cornea can be accurately determined. It is especially valuable in cases of scratch-wounds of the cornea (nail keratitis of Nieden).

Von Schöler[4] has frequently used the galvano-cautery in diffuse parenchymatous inflammations of the cornea, especially of the peripheral portions of the membrane. He finds it most effective, however,

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[1] The most perfect arrangement of this kind is said to be a galvano-battery made after the type of Faure, which combines a galvano-cautery and an electric light. It is described by Professor Bottini, of Pavia ("Clinica Chirurgica," 1893, No. 5). The apparatus is the size of a microscope case and can be carried about without the escape of fluid, which need not be renewed but once in six months' time.

[2] "Archiv für Augenheilkunde," XXII, S. 247.

[3] "Centralblatt für praktische Augenheilkunde," 1891, S. 129.

[4] Albrand, "Berliner klinische Wochenschrift," 1892, Nr. 10.

when distinct points of deeper infiltration are present (whether situated peripherally or centrally) in the diffusely clouded tissue.

The procedure consists in touching the most affected portions superficially with the incandescent wire.

The chief value of the galvano-cautery consists in the fact that the highest degrees of heat that are practicable for the cure of the condition can be applied to a distinctly localized part of the tissues without injuring any of the surrounding areas. For this reason also, the incandescent wire may be employed upon the external edge of the lid, as in distichiasis, producing a cicatricial contraction which draws the eyelashes away from the corneal surface.

Electrolysis.—This process may be employed to remove the cilia. In its performance, the negative pole in the form of a needle-point is introduced into the root-sheath of the hair at the edge of the lid, while the positive pole is placed on the cheek. The procedure is painful, and almost without exception should be made while the patient is under the general anesthetic effect of ether. It is said by Sack,[1] however, that a four per cent. strength of cocaine ointment is capable of rendering the portion of the lid to be operated upon sufficiently insensitive as to prevent the patient from feeling any pain during the procedure.

Electrolysis is employed by some for the removal of corneal scars. To do it properly, after cocaini-

[1] "Berliner klinische Wochenschrift," 1892.

zation, the button-pointed zinc pole of a battery of four elements is placed directly upon the cornea, while the other pole, the copper one, is laid against the conjunctiva. The method has been found useful in telangiectasis, epithelioma,[1] cavernous angioma, and warts of the lids. In cases of large tumors, Grossmann[2] employs what is known as bipolar electrolysis. For the removal of small tumors he uses the unipolar form of twenty elements. (Regarding the use of electrolysis in detachment of the retina, see chap. XIV.)

Although the curative value of the **constant current** cannot be said to be striking, yet it is employed in a number of affections, especially in the innervation groupings. It is used in paralysis of the muscles of the eyelids and eyeball, and it is employed in blepharospasm, in supra-orbital neuralgia with its corresponding epiphora, in herpes zoster, and in diseases of the optic nerve. Recently it has been recommended in the treatment of episcleritis (chap. X), corneal opacities, blepharitis, and many other conditions. (See special part.)

The **induced current** has fewer indications. Schmidt-Rimpler recommends it in the after-treatment of diplopia. He places both poles on the closed eyelids near the paralyzed muscles. Employed in combination with the constant current,

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 481. Alt.

[2] "Wiener medizinische Presse," 1891, Nr. 11–15.

Michel[1] recommends it, even in atrophies of the optic nerve. (Concerning its use in paralysis of the ocular muscles see chap. XVII).

The electro-magnet might properly be included under the head of electricity, but as it is, however, used only in the case of removal of iron particles from the eyeball, its employment will be mentioned later.

CHAPTER V.

GENERAL TREATMENT.

It is superfluous to write concerning the fundamental principles of general treatment, since they are, for the most part, so apparent that they are in reality self-explanatory. This is true of cleanliness; the guarding against harmful influences, as bright light, smoke, dust, etc.; and the avoidance of too great changes in temperature. A few points may, however, be properly mentioned here. One that may be noted is the frequent neglect to keep the patients with severe ocular inflammation for a proper period of time in bed.

Protective Agents.—Among the protective agents, shades, veils, and shell-shaped shields are to be recommended. Especially is this so for eyes from which there is not much lacrimation. In some

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[1] Michel, "Lehrbuch der Augenheilkunde," 1890, S. 517.

cases a layer of calico sewed into an ordinary cap or hat, which will keep it fixed while the eye beneath can be freely moved, is most excellent. Regarding coquilles, opinions greatly differ. For example, Schmidt-Rimpler says that blue goggles are best, since they exclude the detrimental red rays, while the smoked glasses permit the passage of various colors in an unequal manner. On the contrary, Meyer[1] states that smoked glasses are the better, because through them objects have their natural hues, the general light only being softened. It, however, should be made certain that the grayish color of the glass has not a violet shade, this being readily determined by placing a piece of white paper beneath the glass. The rule should be observed with blue glasses as well as with smoked ones, that too dark a tint is not worn. Königstein, however, maintains that both tints are equally good, and that the choice should be left to the patient.

Although the majority of diseases of the eye interfere with the pursuit of the patient's occupation, yet no rules can be given concerning such matters, these being in the hands of the tactful physician.

To the general treatment belongs also the attention which in severe cases of ocular inflammation should be bestowed upon the circulatory and the respiratory organs. Caution should be exercised against acts which produce a congestion of the head, such as strong pressure or straining. Care should

[1] Meyer, "Lehrbuch der Augenheilkunde," translated by Block, 1875.

be taken to see that no tight and uncomfortable neck-bands are worn. Advice should be offered against the employment of tight-fitting clothing, such as corsets and neckerchiefs. Attention should be given to the digestive tract, and constipation should always be relieved.

In a number of diseases of the eye it is desirable, in addition to the special ocular remedies, to employ various general adjuvants to treatment. As such, particularly, moderate amounts of sleep are to be mentioned.

Blood-letting.—This is secured with natural leeches or by means of the artificial one of Heurteloup. Some of the text-books draw the distinction that artificial blood-letting is to be used in inflammations of the deeper parts of the eye, whereas in diseases of the anterior portions of the organ, the natural leech is to be applied—this being based on the theory of vascular supply.

Hirschberg[1] has not seen any satisfactory results from the use of the Heurteloup artificial leech. Its chief effect, he says, is a disagreeable scar. His opinion is also unfavorable regarding the natural one. On the other hand, Königstein, Schmidt-Rimpler, Saemisch, and others find the effect of blood-letting often very excellent. To secure such results, however, they say that the patients should, after the bleeding, be placed in bed in a darkened room. It is also stated that the action of atropine

[1] "Einführung in die Augenheilkunde," 1892.

in acute iritis is more readily secured immediately after the bleeding. As a rule, in such cases, however, the anodyne effect produced is a minimum one, while rest in bed, a darkened room, diaphoretics, and cocaine-ointment, are of more permanent value. In fact, foot-baths often act more favorably than local bleeding. According to a verbal communication, Saemisch states that he has observed that the effect of the Heurteloup leech upon vision, even in cases of chronic irido-choroiditis, is a striking one.

Local and General Measures in Inflammation.—To the first class belong the use of tincture of iodine in scleritis,—which drug should be painted on the temple and frontal region of the side of the diseased eye,[1]—and the employment of mercury ointments in acute iritis. For this purpose, Arlt's forehead ointment enjoys general favor. Cantharides-plaster and the seton have been generally abandoned.

72. ℞. Hydrargyri præcipitatæ albæ, . 1|0 gm. (gr. xv)
Extracti belladonnæ, ... 1|0 gm. (gr. xv)
Unguenti simplici, ... 10|0 gm. (ʒiiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for forehead.

73. ℞. Unguenti hydrargyri cinerei,
Unguenti simplicis, . . aā 5|0 gm. (ʒi¼)
Extracti belladonnæ, ... 1|0 gm. (gr. xv).
Misce et fiat in unguentum.
SIGNA.—Ointment for forehead.

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[1] Fuchs, in his "Text-book of Diseases of the Eye," recommends Arlt's ointment in blepharospasm induced by phlyctenulæ. The formula is:

℞. Unguenti hydrargyri cinerei, . 5|0 gm. (ʒi⅓)
Extracti belladonnæ, ... 0|5 gm. (gr. viij).
Misce et fiat in unguentum.
SIGNA.—Ointment. To be used on forehead three times daily.

Among the general measures are the diaphoretics, which are used in part in the form of teas, and as medicaments. Among these may be cited jaborandi, pilocarpine, and salicylate of soda. The last,

74. ℞. Pilocarpini hydrochloratis, . . 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 5|0 c.c. (℥i⅓).
Misce et fiat in collyrium.
SIGNA.—For an adult, one hypodermatic syringeful every other day.

especially, is used exclusively in many clinics, two grams (gr. xxx) at night before retiring producing sufficient effect. Owing to the nauseating sweetish taste of salicylate of sodium, this drug frequently disagrees with the patient. Inquiry should be made concerning this, and, if necessary, a few peppermint lozenges may be ordered to be taken after the administration of the drug. Tea and coffee answer the same purpose. In less severe cases hot footbaths may be substituted. In general, the treatment of all constitutional symptoms should be considered. For example, in anemia, iron and roborants should be given, and when intermittent fever is suspected in corneal and retinal diseases, proper systemic therapy (such as quinine) should be used.

Creasote or tuberculin should be used in tuberculosis. Tuberculin is also recommended by Hirschberg in leprosy of the eye. In scrofula, the whole range of anti-scrofulous remedies is employed. In this connection, should be mentioned the very beneficial results of several weeks in the country upon city children with diseases of the lids and conjunctiva. In diabetes, antidiabetic hygiene and remedies are indicated. In rheumatism, the salicylic acid prepa-

rations, especially salicylate of sodium,—which is, as has just been mentioned, also given as a diuretic in non-rheumatic conditions,—are to be recommended. In mydriasis after diphtheria, one of the results of paralysis of accommodation, Schmidt-Rimpler has seen a marked lessening of the length of the period of the course of the sphincter muscle paralysis when the case has been treated with diphtheritic serum. Thus it will be seen that the general treatment, if properly appreciated and taken into consideration, exerts a favorable influence upon the constitutional and local conditions of the patient. This is most important and most strikingly visible in syphilitic diseases of the eye, which are numerous, and often threaten vision to an alarming degree. This is especially true of diseases of the iris, the inner coats of the eye, and the optic nerve. Often, conjunctival diseases are the starting-points of the ocular manifestations, appearing very rarely in form of gummatous formations. At times, the diseases are associated with severe irritative phenomena, especially in the well-known forms of iritis. Hirschberg considers it erroneous, and his view agrees with the author's own experience in syphilitic diseases of the chorioid and retina (apart from the usual treatment of the eye), to not employ anything but iodide of potassium as general treatment. If success be desired, an energetic systemic treatment should be instituted. Under this head comes, in the first place, mercury and iodide of potassium, with precautions as to their effects upon the mouth.

Hirschberg's[1] method is as follows: Inunctions of two grams (ʒss) each of gray ointment are to be rubbed into the skin of various parts of the body twice daily for five days' time. This is to be followed by a bath, with subsequent rest for a period of three days. In accordance with the indications, this plan of treatment is to be continued for from eight to twelve weeks. One or two grams (gr. xv–ʒss) daily should be used for large children. Smaller children should employ three-fourths of a gram (gr. xij) a day, while infants should be given but one-half of a gram (gr. viiss) in the same period of time. He also notes that affections of the mouth are rarer in children than they are in adults. As adjuvants to this mode of treatment, two to five grams (ʒss–ʒi¼) and even ten grams (ʒiiss) of iodide of potassium per day should be administered to adults. According to the nature of the case, the subsequent treatment is to be continued for two or three years' time. Every three months a mild course of inunctions, lasting for from two to three weeks' time, should be enjoined. In such cases, Hirschberg considers subconjunctival injections of corrosive sublimate superfluous. His experience has led him to believe that the drug acts better when it is given in pill form. The subcutaneous injections of bichloride of mercury he also does not consider recommendable.

A special form of hydrotherapy that has been

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[1] "Einführung in die Augenheilkunde," 1892.

adopted in several clinics is the bath-cure, combined with Turkish-Roman baths; a great number of diseases of the eye, especially those that are associated with rheumatic and specific conditions and with hydremia, being treated in this manner. Scrofulous corneal diseases are beneficially affected by the same form of treatment, but in this type of cases salt-baths are contraindicated. In chorioidal diseases and toxic amblyopias hydrotherapy may be combined with the inunction treatment, the rubbings following the baths. By this method, the duration of attacks of iritis are shortened and episcleritis and vitreous opacities are rapidly improved. It is only in atrophic conditions that success is unobtainable.

Where the appointments for the use of the Turkish-Roman baths are lacking, it is advisable, in cases that are suitable for this plan of treatment, to employ a method of producing profuse perspiration which has been in use for many decades in the treatment of nephritis. A safety-lamp, placed beneath a wire frame for supporting the bed-covers with, is used to secure the necessary heat. The more modern form of apparatus of Moosdorf (steam sweat-apparatus) and other similar contrivances are more practicable. The principles of the general treatment of syphilitic diseases of the eye, as observed in the Royal Eye Clinics of Berlin[1], should be mentioned here.

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[1] Silex, "Deutsche medicinische Wochenschrift," 1888, Nr. 43, S. 878.

Confinement in the hospital is essential, because it has been found that the patient cannot make the proper inunctions at home. Three grams (gr. xlvj) of gray ointment are rubbed in daily in a single application. Five inunctions constitute a cycle of consecutive treatments, these being followed by having the patient take a warm bath. These routine treatments are repeated until from ninety to one hundred grams (℥ ij et ℥ ss–℥ iij) of the ointment have been used, this requiring from thirty to thirty-five days. Simultaneously with this, a sweat-cure is instituted, the patient being sweated for two days in succession, followed by a day of omission. For this purpose two grams (℥ ss) of salicylate of sodium, followed by a cup of warm tea, with a dry pack lasting from two to three hours' time are given. This treatment has also been found valuable in rheumatic episcleritis of non-specific origin. In all cases a wholesome diet should be conjoined with the treatment above indicated. As the cure advances, and toward the end of the method, iodide of potassium should be prescribed, the dose of the drug being

75. ℞. Potassii iodidi, ... 5 | 0 gm. (℥ i¼)
Aquæ destillatæ, ... 200 | c.c. (f ℥ vj, f ℥ iij).
Misce et fiat in solution.
SIGNA.—One tablespoonful two or three times daily.

governed by the indications in each individual case. Silex has also found that inunctions are more efficient than subcutaneous corrosive-sublimate injections.

SPECIAL PART.

CHAPTER VI.

TREATMENT OF DISEASES OF THE LIDS.

1. HYPEREMIA OF THE PALPEBRAL SKIN.

Causes.—External irritants, as cold air and over-use of the eyes, are the most frequent causes of hyperemia of the skin of the lids. The palpebral edges are reddened, this condition being known as hyperemia marginalis.

Treatment.—Douches (see p. 15) once or twice daily, painting with one per cent. strength solutions of nitrate of silver every second day, in combination with cold lead-water compresses to be used at home, are all at times indicated. The last form of applications, however, is not always well borne. The best treatment is that which is directed toward the cause. Anomalies of refraction, improper air, tobacco-smoke, sitting up late at nights, reading by lamp-light, scrofula, and chlorosis are some of the principal causative factors that must be corrected or remedied. Those hyperemias which are a part of deeper inflammations of the eye will not be considered here.

Erythema of the Lids.—In this condition the skin of the eyelids is scarlet-red and shiny.

Causes.—It frequently appears after insolation or traumatism, as, for example, powder-burns.

Treatment.—Lead-water, three-tenths per cent. strength solutions of nitrate of silver, and lanoline or vaseline ointment are all applicable. In the case of burns, boric acid ointment is also recommended (see formula 82). In addition, any of the following eye-washes may be prescribed :

76. ℞. Misturæ oleoso-balsamicæ,[1]
Aquæ aromaticæ, ... āā 60 gm. (ʒiss)
Aquæ fœniculi, ... 100 c.c. (fʒiij, fʒiss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. (de Leuw.)

77. ℞. Sodii biboratis, ... 1 0 gm. (gr. xv)
Aquæ laurocerasi, ... 5 0 c.c. (fʒi⅓)
Aquæ destillatæ,
Aquæ fœniculi, ... āā 100 c.c. (fʒiij, fʒiss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

The author has also found the following prescription quite useful :

78. ℞. Misturæ oleoso-balsamicæ,[1] . 15 gm. (gr. xxiij)
Sodii salicylatis, ... 3 0 gm. (gr. xlvj)
Aquæ destillatæ, ... 150 c.c. (fʒiv, fʒviss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

This collyrium, by reason of its being mild, has also proved valuable in the treatment of some of the diseases of the lids to be described below, keeping well, and being liked by the patients.

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[1] German Pharmacopeia.

2. INFLAMMATION OF THE EYELIDS.[1]

(*a*) **Marginal blepharitis** (*blepharoadenitis; marginal seborrhea,—both the dry and the moist forms*) is characterized by a slight redness and desquamation at the outer edge of the lid. This is accompanied by sensitiveness and itching. A tender skin is said to be the predisposing cause.

Treatment.—This consists in cleansing the inflamed surfaces with cotton and oil, followed by the use of lead-water compresses, cold chamomile tea with lead-water, or diluted cologne water (see formulæ for eye-washes on p. 16). Later, localized inunctions with one of the following ointments, using a mass about the size of a pea at a time, may be employed:

79. ℞. Hydrargyri oxidi flavi, . . . 0|4 gm. (gr. vj)
Aceti plumbi,[2] . . . . . gtt. iv
Vaselini, ... 8|0 gm. (ʒij).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. (Schmidt-Rimpler.)

80. ℞. Zinci oxidi, ... 0|1 gm. (gr. iss)
Vaselini albæ (American), . . 10|0 gm. (ʒiiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

81. ℞. Plumbi acetatis, ... 0|1 gm. (gr. iss)
Vaselini albæ (American), . . 10|0 gm. (ʒiiss).
(Michel.)

In this connection, however, it is important to

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[1] Königstein distinguishes: blepharitis or blepharoadenitis; squamous blepharitis; and eczematous or ulcerous blepharitis. Fuchs differentiates hyperemia of the edges of the lids, and squamous and ulcerative blepharitis.

[2] German Pharmacopeia.

study each individual case, since ointments are not infrequently badly borne. All diseased cilia should be removed. The following ointments are also useful:

82. ℞. Acidi borici, ... 0|25 gm. (gr. iij)
Vaselini, ... 5|0 gm. (ʒi⅓).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

82*a*. ℞. Hydrargyri præcipitatis albæ, . 0|1 gm. (gr. iss)
Unguenti emollientis, ... 10|0 gm. (ʒiiss)
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. (Fuchs.)

83. ℞. Hydrargyri præcipitatis albæ . 0|06 gm. (gr. $\frac{9}{10}$)
Vaselini, ... 3|0 gm. (gr. xlvj).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. (Königstein.)

84. ℞. Saccharini saturnini, ... 0|06 gm. (gr. $\frac{9}{10}$)
Cocainæ hydrochloratis, . . . 0|1 gm. (gr. iss)
Vaselini, ... 3|0 gm. (gr. xlv).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. (Königstein.)

In obstinate cases, touching of the lids with a nitrate of silver stick is useful. In others, where it is believed that the cause is vasomotor in type, the constant current may be of advantage.

(*b*) **Ciliary blepharitis** (*eczematous blepharitis*, *ulcerous blepharitis*, *palpebral eczema*) is characterized by an increase of the inflammation of the lid, the formation of ulcers and minute abscesses. The cilia are loosened and fall. The inflammatory process may extend to the conjunctiva, producing ectropium.

Treatment.—Warm cataplasms to loosen the

crusts, chamomile tea, and painting of the lids with two per cent. strength solutions of nitrate of silver are all valuable. Before any definite treatment can be made, however, all crusts should be removed. The careful application of tar ointment is extremely useful.

85. ℞. Olei cadini, ... 1|0 gm. (gr. xv)
Vaselini, ... 2|0 gm. (ʒss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. (Schmidt-Rimpler.)

86. ℞. (Hebra's salve.)
Emplastri diachyloni, ... 5|0 gm. (ʒi⅓)
Vaselini, ... 15|0 gm. (ʒiij, gr. lj).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

Or—

℞. Unguenti diachyloni Hebræ, . 20|0 gm. (ʒv).

At times, if the little ulcers at the edge of the ciliary margins are not clean, they may be touched with the point of a sound that has been dipped in melted nitrate of silver. This drug may also be used to advantage in the form of an ointment. In the beginning, Schreiber (Magdeburg) employs an ointment of a quarter per cent. strength of nitrate of silver twice a day. Later, he makes use of it but once daily.

87. ℞. Argenti nitratis (pulv.), . . . 0|2 gm. (gr. iij)
Vaselini albæ (American), . . 4|0 gm. (ʒj)
Liquoris plumbi subacetatis, . 0|25 c.c. (ℳ$\frac{3}{5}$).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. (Graefe,[1] Guthrie's salve.)

[1] "Handbuch der Arzneiverordnungslehre," 1883, S. 181.

The constitution of the patient is also to be studied, and attention is to be devoted to the nasal sinuses.[1] The position of the lacrimal punctum should be determined, and the condition of the lacrimal passages should be examined. It is advisable to apply the ointment to the lids at night, this being preferably done with a glass rod. If necessary, the edges of the lids may be covered with Hebra's diachylon ointment (see formula No. 86), spread upon boracic acid lint daily, alternating its use between the two eyes. One per cent. strengths of the ointments of white or yellow precipitate (Nos. 38 to 44, 82 *a*) are also valuable.

For domestic use, Schweigger recommends cold lead-water compresses (six drops of the solution of acetate of lead to a teacupful of boiled water), with yellow oxide of mercury ointment at night. In other clinics, Kummerfeld's lotion is, for evident reasons, preferred.

88. ℞. Camphoræ, ... 0|4 gm. (gr. vj)
Lactii sulphuræ, ... 4|0 gm. (ʒj)
Aquæ calcariæ,[2]
Aquæ rosæ, ... āā 40|0 c.c. (ʒj–ʒij)
Acaciæ, ... 0|8 gm. (gr. xij).
Misce et fiat in collyrium.
SIGNA.—Eye-water. Apply locally before retiring each night.

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[1] The following is to be recommended for application to the nose:

℞. Iodol, ... 1|0 gm. (gr. xv)
Acidi tannici, ... 2|0 gm. (gr. xxx)
Lanolini, ... 10|0 gm. (ʒiiss)
Olei olivæ, ... quantum sufficit.
Misce et fiat in unguentum.
SIGNA.—Ointment for the nose.

[2] German Pharmacopeia.

Or—

89. ℞. Hydrargyri præcipitatæ albæ, ... 0|2–0|3 gm. (gr. iij ad gr. ivss)
Zinci oxidi albæ, ... 0|3–0|5 gm. (gr. ivss ad gr. viiss)
Aceti plumbi,[1] . . . . . gtt. iv ad vj
Unguenti glycerini, ... 10|0 c.c. (f℥iiss).
Misce et
SIGNA.—Use as directed.

90. ℞. Zinci sulphatis, ... 1|0 gm. (gr. xv)
Amyl, ... 4|0 gm. (℥j).
Misce et fiat in pulveres.
SIGNA.—Use as directed. (Hirschberg.)

In France[2] the following formula is used:

91. ℞. Hydrargyri chloridi corrosivi, ... 0|1–0|3 gm. (gr. iss ad gr. ivss)
Glycerini, ... 10|0 c.c. (f℥iiss).
Misce et fiat in solutionem.
SIGNA.—To be applied locally twice daily, by the physician.

At present, one per cent. strengths of resorcin and ichthyol ointments are being tested for their value in blepharitis.

(*c*) **Blepharo-conjunctivitis.**—This variety of inflammation may occur both as an acute and as a chronic condition, the conjunctiva taking part in an eczema of the lids, with or without concomitant irritation of the cornea. The symptoms are lacrimation, photophobia, and blepharospasm. The disease is common in scrofulous children, and occurs especially in families who are living in unhygienic surroundings.

Treatment.—Cleanliness is of the first importance.

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[1] German Pharmacopeia.

[2] "La Semaine Mèdicale," 1893, 1.

As such children are fond of covering the eyes, both their hands and their faces, as a rule, are soiled with eczematous material, with which the profuse nasal secretions mix to a greater or a lesser extent. Frequently, eczema of the scalp, with excoriations along scratch-marks that the patients are apt to make, are present. For these reasons, careful attention should be paid to the condition of the finger-nails and the hands. Each conjunctiva is to be treated separately, after which the eyelids are to be cleansed with cotton and oil, followed by the employment of one of the accompanying ointments, which is best applied by being spread upon some boric acid lint or mull:

92. ℞. Unguenti Hebræ,
Lanolini (Liebreich), . . . āā 30|0 gm. (ʒ vij et gr. xlij)
Adipis, ... 5|0 gm. (ʒ i⅓).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

93. ℞. Emplastri diachylonis simplicis, 10|0 gm. (ʒ iiss)
Vaselini, ... 40|0 gm. (ʒ j et ʒ j).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment. (Michel.)

If desired, a three per cent. strength solution of boric acid or a one per cent. strength of resorcin-ointment may be used. If the eczema of the lids is impetiginous in character, the following formula will be found useful:

94. ℞. Ichthyolis,
Zinci oxidi,
Gelatini, ... āā 5|0 gm. (ʒ i⅓)
Aquæ destillatæ,
Glycerini, ... āā 25|0 c.c. (ʒ vj et ♏xxv).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. To be used warmed. (Michel.)

In cases of hypersecretion of the conjunctiva, a three to five per cent. strength of boric acid-vaseline ointment, or starch used as a dusting powder, is sufficient. In protracted cases, where the treatment described has failed, the use of tar-ointment becomes advisable, the diseased region being anointed once daily with equal parts of pure tar and olive oil. Fuchs, however, properly cautions against the employment of strongly irritant ointments. If photophobia is present, bandages are contraindicated. Where the eczematous eruption has a squamous character, the following formulæ are especially suitable:

95. ℞. Zinci oxidi albæ, ... 1|0 gm. (gr. xv)
Vaselini, ... 40|0 gm. (℥j et ʒj).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

Or—

96. ℞. Hydrargyri præcipitatæ albæ, . 1|0 gm. (gr. xv)
Vaselini, ... 40|0 gm. (℥j et ʒj).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

Oleum rusci or oleum fagi are also to be recommended. They should be painted on the skin-surface in a thin layer, without irritating the underlying conjunctiva. Instead of these, the following ointment may be used:

97. ℞. Hydrargyri præcipitatæ albæ, . 0|5–07|5 gm. (gr. vij ad gr. xj)
Picis liquidæ, ... 2|0 gm. (ʒss)
Unguenti, ... 7|5 gm. (ʒj et gr. lv).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

For the moist areas, Fick recommends the following ointments :

98. ℞. Zinci oxidi, ... 1|0 gm. (gr. xv)
Acidi salicylatis, ... 0|1 gm. (gr. iss)
Vaselini, ... 10|0 gm. (ʒiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

99. ℞. Hydrargyri præcipitatæ albæ, . 1|0 gm. (gr. xv)
Vaselini, ... 10|0 gm. (ʒiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

In chronic cases with contraction of the edge of the lid or with thickening and persistent redness, painting of the diseased areas with nitrate of silver is employed. If there is much itching, it can be relieved by use of the accompanying formula :

100. ℞. Zinci sulphatis, ... 1|0 gm. (gr. xv)
Amylis, ... 4|0 gm. (ʒj).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids. To be used twice daily. (Hirschberg.)

3. ANOMALIES OF SECRETION.

Among these anomalies may be named the following secretory disturbances connected with the glands of the lids.

1. **Sudamina,** or millet-seed sized vesicles, are sometimes found. These are generally situated at the edges of the lids. They are to be opened with a needle.

2. **Seborrhea,** or an increase in the sebaceous secretion, producing fatty scales which cover the margin of the lids, and occurring in anemia, chlo-

rosis, and the syphilis of childhood, is often present. The surfaces should be cleansed with cotton and warm soap-suds and water, or coated with glycerol and oil. The parts should then be douched with cold water to which a little eau de cologne or other lotion (see p. 16) has been added. This seborrhea, as decided by Michel,[1] appears to be identical to the marginal type. The ointment-treatment,[2] at least, is the same (see p. 85).

3. **Ephidrosis,** or a hypersecretion of the sweat-glands, which may lead to excoriation of the lids, may be present. Treatment in this condition consists in hydrotherapy and painting the affected portions with solutions of one-half per cent. strengths of nitrate of silver.

4. **Chromidrosis,** known as blue sweat, in which there is a blue or a bluish-black discoloration of the lids, is rarely seen. This condition is best combated by mechanical treatment with oil and glycerol.

5. **Hypersecretion of the Meibomian glands,** or Meibomitis, which consists in small, round elevations containing a stearin-like material, situated on the tarsal surface of the palpebral margin, is quite common. Each swollen area should be punctured with a needle and the underlying contents evacuated.

6. **Conjunctival lithiasis,** an affection of middle life and old age, is practically a condition in

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[1] "Lehrbuch der Augenheilkunde," 1890, S. 128.

[2] Schmidt-Rimpler, "Augenheilkunde," 1889, S. 624.

which there are a number of hard concretions or calcareous deposits. Though situated in the glandular coils of the tarsus, the nodules project up to the level of the conjunctiva, and thus give rise to disturbance. They should be extirpated with the aid of a broad needle.

7. **Chalazion.**—This consists in a circumscribed tumor which is situated in the tarsal cartilage. As a rule, when the growth has attained any size, treatment becomes purely operative. When it is small, inunctions with an ointment of iodide of potassium or of iodized glycerol are said to produce absorption. Probably the massage is the potent agent.

Secretory anomalies may lead to smaller or larger circumscribed inflammation, such as:

1. **Pustulous Acne.**—This condition has proved itself to be an inflammation of the sebaceous glands and the hair-follicles. In each pustule the staphylococcus pyogenes aureus is found.

2. **Hordeolum.**—This, which is ordinarily known as a *stye*, is practically a palpebral furuncle. The treatment consists of cold when the case is recognized in its early stages. If not seen until suppuration is established, hot compresses or cataplasms should be used. Schmidt-Rimpler prefers tepid lead-water, and later opens the abscess.

Michel recommends:

101. ℞. Hydrargyri chloridi corrosivi, . 0|01 gm. (gr. $\frac{3}{20}$)
Vaselini, ... 30|0 gm. (℥ vij et gr. xlij).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

Fick favors bags of hot, dry chamomile. For the after-treatment and the prevention of recurrence, the douche and nitrate of silver are valuable. Massage is said at times to favor the development of stye. Königstein recommends:

102. ℞. Hydrargyri oxidi flavi, . . . 0|1 gm. (gr. iss)
Lanolini, ... 5|0 gm. (ʒi⅓).
Glycerini, ... q. s.
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

103. ℞. Hydrargyri oxidi flavi, . . . 0|1–0|2 gm. (gr. iss ad gr. iij)
Ceræ albæ, ... 1|5 gm. (gr. xxij)
Axung. porci, ... 3|5 gm. (gr. lxiv).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

104. ℞. Sulphur sublimati, ... 3|0 gm. (gr. xlvj)
Ammonii chloridi, ... 1|0 gm. (gr. xv)
Aquæ rosæ, ... 50|0 c.c. (fʒj. fʒv)
Spiritus camphoræ, ... 10|0 c.c. (fʒiss).
Misce et fiat in collyrium.
SIGNA.—For local use upon the eyelids.

3. **Acne Rosacea.**—This condition is merely a part of the same disease of the face. The treatment consists in sulphur paste and iodized glycerol. According to Michel, scarification is useful. The accompanying form of sulphur ointment is of value:

105. ℞. Sulphur depurati,[1] . . . . . 1|0 gm. (gr. xv)
Camphoræ,
Olei olivæ, ... āā 0|6 gm. (gr. ix)
Unguenti rosati,[2] . . . . . 15|0 gm. (ʒiij, gr. lj).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

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[1] "Handbuch der Arzneiverordnungslehre," 1883, S. 615.

[2] German Pharmacopeia.

4. **Acne Mentagra.**—This disease is also known as *sycosis of the eye-lashes and eye-brows.* In this condition there are pustules situated at the base of the cilia. The treatment that has been found the most beneficial consists in the removal of the crusts with oil or glycerol, combined with epilation: otherwise the methods pursued are the same as those that are employed in the treatment of palpebral eczema.

5. **Palpebral Carbuncle.**—This disease, which is very rare, consists in the spreading of a furuncle of the lid and its conversion into a carbuncle. It generally appears at the inner canthus. Treatment consists of an incision with the use of a sharp spoon. Strict antisepsis should be enjoined.

6. **Malignant Pustule.**—According to Michel, this condition is, as a rule, observed among tanners, shepherds, and others who are living near animals. The affection is especially prone to appear on the right upper lid, this most probably being on account of the greater use of the right hand. Treatment of this is the same as that for carbuncle.

4. DIFFUSE INFLAMMATION OF THE LIDS.

1. **Palpebral Erysipelas.**—This disease ordinarily occurs as part of a facial erysipelas. It generally appears in the form of a bullous, phlegmonous, or gangrenous inflammation. The treatment is the same as that which is employed for any other form of erysipelatous inflammation. For use upon the lid

itself, tincture of iodine, ointment of iodide of potassium, or iodized glycerol in solution may be used. If the cause is found to be a suppurative dacryocystitis, this condition should be treated in the usual manner, and with the addition of lead-water and antiseptic cotton.

2. **Malignant Edema.**—This affection, fortunately, is very rarely observed. Just as in erysipelas, the streptococcus has been found to be the cause, so in this disease, bacteria have been shown to be the causative agents. Insect bites have also been assumed to be the etiological factors (Michel). The treatment is radical, and should be done under antiseptic precautions.

3. **Disease of the Lids or Edema in Acute Exanthemata.**—Such a condition is generally found in measles, scarlet fever, variola, and varicella. If it is seen in small-pox, it necessitates a special treatment, consisting first in cleansing with a one to three thousand strength solution of bichloride of mercury, followed by an ointment made of the same drug.

4. **Herpes Zoster Ophthalmicus.**—This disease is ordinarily characterized by a sharp limitation of the condition to one side, with a regular arrangement of the vesicles, thus serving to distinguish it from erysipelas.

Treatment is practically symptomatic. Some authorities recommend compresses of oil. Others enjoin rest in bed and the use of atropine. Still others make use of dusting-powders and vaseline

or lanolin ointments. Internally, Fowler's solution should be employed. In the later stages of the disease, the constant current may be used.

5. **Eczema.**—Such a local expression, as a part of general distribution, is seen in cases of insolation, and in individuals working near furnaces.

Treatment consists in whatever is employed for the general condition. Dusting with starch and application of boric acid in vaseline ointments are both useful.

6. **Syphilitic Inflammation.**—Such a condition is especially seen at the margin of the lids. In addition to the characteristics of the local disturbance, the diagnosis is based on the history of the case and the existence of enlarged, hard glands in the neighborhood. General treatment, with local dusting with calomel, corrosive sublimate in 0.5 to 300.0 strength, followed by red mercurial ointment, 0.5 to 8.0 strength (Schmidt-Rimpler), with gray ointment or iodoform (Michel), are all to be recommended.

7. **Lupus and Lepra.**—These affections either demand surgical treatment, particularly the use of the sharp spoon, or antiparasitics for their removal.

5. NEW GROWTHS, PARASITES, ETC.

Among these, *angioma*, or *telangiectases*, and *varices* are found. Treatment for them is operative, galvano-caustic, or electrolytic in character. *Retention cysts* at the edges of the lids, and *atheromatous* and *dermoid cysts*, also occur. As atheromatous

cysts, which are described in the text-books, seem to have their most frequent seat at the upper, outer edge of the lid, are congenital, and are found to contain, when microscopically examined, the constituents of the cutis, they are more properly classed as *dermoids*. Treatment is operative. *Fibroma molluscum*, *lipoma* (which is rare), *melano-sarcoma*, *epithelioma*, and *xanthoma* may at times be found. The parasites most frequently met with are the *body-louse* (particularly) and the *head-louse*. In most cases the diagnosis can only be determined by the use of a magnifying lens. Treatment consists in the application of gray ointment. As the parasites are only discernible by careful observation, it is wise, in suspected cases, to use the forceps. Often the ointment can be applied to the edge of the lid, which should be carefully watched for some time. If any pediculi are present, they will soon manifest themselves by undue movements. *Favus* and *cysticercus vesicles* may occur in the connective tissue of the lids. *Actinomycosis* has also been observed as an abscess of the lid at the inner canthus. In these cases, the characteristic rays and filaments are found on microscopic examination. The cause of the condition has been ascribed to the use of the beef employed as a medicament on the eyelids. Treatment consists in the local use of chloride of zinc and the use of the Paquelin-cautery, iodide of potassium, and one to one thousand strengths of corrosive sublimate.

6. DISEASES OF THE MUSCLES AND NERVES OF THE LIDS.

These conditions may be symptomatically divided into five groupings:

1. **Winking, nictitation,** and **clonic spasm**; In the majority of such cases, treatment consists in the study and the estimation of any error of refraction, with the prescribing of suitable glasses.

2. **Blepharospasm** and **tonic spasm.**—These conditions are chiefly reflex in type and are frequently the disagreeable accompaniments of phlyctenulæ of the cornea, with the presence, at times, of foreign bodies. Not infrequently, vision has been reported to be lost, but necessarily this has been rare. Treatment should be both causative and symptomatic in character. Immersion of the face in cold water is cruel, and most frequently, is ineffectual. A brief ether-narcosis in conjunction with inunctions of cocaine-ointment and warm baths are unquestionably, especially in children, much better. In cases of superficial loss of the epithelium of the cornea, a moist protective dressing, with a two per cent. strength solution of cocaine and atropine, two or three times daily, may be employed to advantage.

106. ℞. Cocainæ hydrochloratis, . . . 0|1 gm. (gr. iss)
Vaselini, ... 3|0 gm. (gr. xlv).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

107. ℞. Atropinæ sulphatis,
Cocainæ hydrochloratis, . . āā 0|05 gm. (gr. $\frac{7}{10}$)
Vaselini albæ (American), . . 5|0 gm. (ʒi½).
Misce et fiat in unguentum.
SIGNA.—Ointment for eye.

If neuralgia exists and tender points can be found, —pressure upon which controls the blepharospasm, —massage and the spray-douche may be usefully tried (Königstein). Likewise, hypodermatic injections of morphine or cocaine over the tender points may be given.

The constant current may also be applied, the negative pole being placed upon the eyelids and the positive one upon the nape of the neck (or the reverse) for several minutes at a time. If the spasm occurs paroxysmally, quinine or salicylate of sodium may be injected, with or without the use of gentle cathartics. In hysteria, hypnosis or suggestion is to be recommended.

In cases of ordinary bad habits without disease in children, painting the parts with alcoholic solutions or with solutions of nitrate of silver is to be employed.

For the general treatment, tonics should be used. Locally, cold applications should be made to the face, while derivatives and revulsants should be placed upon the forehead and the temple. Occasionally, the use of a blepharostat is to be recommended. The enucleation of a shrunken eye is necessary when it produces, or has a tendency to produce, sympathetic irritation. Scars must also be excised if they act as causal agents. In one case of traumatic blepharospasm that had existed for two months' time, Wellerstein[1] obtained a cure by the employment of inhalations of nitrite of amyl.

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 500.

It has been observed that instillations of cocaine into the external auditory canal,[1] or syringing the canal with cold water, temporarily checks palpebral spasm. The test of the correctness of these observations is not difficult. It has also been stated by Guttierez-Ponce[2] that the entrance of anesthetizing vapors into the auditory canal stops photophobia.

3. **Paralysis of the Orbicularis Muscle.**—This appears chiefly in facial nerve palsy. The treatment of this condition consists in the use of a protective dressings and the employment of measures that are directed toward the cause. Later, electricity should be used.

4. **Ptosis.**—This condition is seen as a part of palsy of the oculo-motor nerve. The treatment that is best adapted is electricity, applied locally, with operative measures later, if necessary.

5. **Partial Ptosis.**—This occurs at times in the form of a slight drooping of the upper lid, appearing as a part of paralysis of the smooth muscle fibers of the upper lid. The condition has been seen by Michel after the puerperium. Treatment consists in galvanization of the cervical sympathetic.

Other abnormalities, such as *emphysema of the lids*, *palpebral suggillation*, *hemorrhages* from paroxysmal whooping-cough, etc., do not demand any special therapy. The treatment of *entropium*, *ectropium*, *symblepharon*, and congenital anomalies, such as *epicanthus* and *coloboma*, is mainly surgical.

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[1] *Ibidem*, 1892, p. 497.

[2] "Recueil d'Ophthalmologie," 1891, January.

CHAPTER VII.

TREATMENT OF DISEASES OF THE LACRIMAL PASSAGES.

Diseases of the lacrimal organs, as a rule, demand surgical treatment, and will only be discussed in detail here in so far as medicinal therapy is applicable to them.

1. **Acute Inflammation of the Lacrimal Gland** (*Dacryoadenitis*).—This disease is most prominently characterized by an inflammatory area situated in the upper, outer part of the upper eyelid. On elevating the lid, the swollen lower part of the lacrimal gland frequently becomes visible. This condition can be best combated by tepid compresses, followed by incision.

2. **Chronic Inflammation of the Lacrimal Gland.**—Here the principal symptom is simply one of chronic swelling in the region of the gland. Ointments of iodide of potassium and tincture of iodine, applied locally, with inunctions of gray ointment and iodide of potassium at times used internally, are some of the remedies that are generally employed.

3. **Abnormalities of the Lacrimal Canaliculi.**—Closure and false position of the puncta require operative treatment. The detection of foreign bodies, such as hairs, etc., necessitates careful inspection; they, of course, should be removed.

4. **Acute Dacryocystitis or Inflammation of the Lacrimal Sac.**—This, which is also termed

phlegmon of the lacrimal sac, is a condition in which there is ordinarily an area of redness that extends over the sac and at times is coexistent with an inflammatory edema, which spreads over the front of the eyeball. The causes are generally strictures of the lacrimal sac, accidental noxious influences, chronic catarrh, and trauma.

Treatment consists in warm applications or cataplasms, with opening of the sac. Irrigation with two per cent. strength solutions of boracic acid or chlorine-water, and packing with antiseptic cotton to prevent too early a healing, are also of value. Treatment directed toward the cause is absolutely necessary. If a fistula exists, nitrate of silver or the galvano-cautery applied to the sinus is indicated, the former method generally being sufficient.

5. **Chronic Dacryocystitis** (*Dacryocystoblennorrhea, Mucous Blennorrhea, Blennorrhea of the Lacrimal Sac*).—This disease is characterized by a more or less circumscribed swelling, situated over the lacrimal sac, from which, upon pressure, a mucous or mucopurulent or purulent secretion can be forced out. In pronounced cases, the best treatment is operative, and consists in periodic dilatation of the passages with sounds. In the simplest cases or when patients are opposed to operative interference, medicinal treatment, such as given in the following prescriptions, may be tried.

108. ℞. Zinci sulphatis, ... 0|03 gm. (gr. $\frac{3}{8}$)
Aquæ destillatæ, ... 15|0 c.c. (ƒ℥iij, ♏lj).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. (Schweigger.)

Or—

℞. Zinci sulphatis, ... 0|05–0|03 gm. (gr. $\frac{7}{10}$ ad $\frac{3}{5}$)
Cocainæ hydrochloratis, . . . 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 1|50 c.c. (f℥ iij, ♏lj).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

The effect of these drugs may be assisted by syringing the sac through the canaliculi with the following solutions:

109. ℞. Acidi borici, ... 0|4 gm. (gr. vj)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

110. ℞. Zinci sulphatis, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. (Schmidt-Rimpler.)

If it be desired that the medicinal agents shall reach the channels more thoroughly, this may be accomplished by means of an Anel's syringe or an irrigator. For this purpose, the following formulæ are useful:

111. ℞. Acidi borici, ... 10|0 gm. (℥ iiss)
Acidi salicylatis, ... 2|5 gm. (gr. xxxviij)
Aquæ destillatæ, ... 500|0 c.c. (Oj).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

112. ℞. Hydrargyri chloridi corrosivi, 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 500|0 c.c. (Oj).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

113. ℞. Hydrargyri oxycyanatis, . . . 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 100|0 c.c. (f℥ iij, f℥ j, ♏xl).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. (Schlösser.)

114. ℞. Hydrargyri chloridi corrosivi, 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 500|0 c.c. (Oj).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

Injunctions should always be given that the injections are to be made with caution, and all unnecessary force is to be avoided. The following, among a number of antiseptics and astringents, have also been recommended for employment:

115. ℞. Aquæ chloratis, ... 20|0 c.c. (f℥ v).
Misce in vitro nigro.
SIGNA.—For instillation. (Hirschberg.)

116. ℞. Aquæ chloratis, ... 100|0 c.c. (f℥ iij, f℥ j, ♏xl).
SIGNA.—One tablespoonful to one liter (Oij) of water for compresses, to be used for one quarter of an hour at a time three times daily.

117. ℞. Iodoformi, ... 15|0 gm. (f℥ iij, ♏lj)
Glycerini,
Aquæ destillatæ, ... āā 50|0 c.c. (f℥ j, f℥ v).
Misce et fiat in solutionis.
SIGNA.—Antiseptic wash.

118. ℞. Creolini,
Aquæ destillatæ, ... āā 25|0 c.c. (f℥ vj, ♏xxv).
Misce et
SIGNA.—Ten to fifteen drops in a glass of warm water for injection purposes.

119. ℞. Potassii permanganatis, . . . 1|0 gm. (gr. xv)
Aquæ destillatæ, ... 100|0 c.c. (f℥ iij, f℥ j, ♏xl).
Misce et fiat in solutionis.
SIGNA.—Twenty drops in a glass of warm water for injection purposes. (Königstein.)

In cases with marked discharge, the following formula is indicated:

120. ℞. Argenti nitratis, ... 0|25–1|0 gm. (gr. iij ad gr. xv)
Aquæ destillatæ, ... 100|0 c.c. (f℥ iij, f℥ j, ♏xl).
Misce et fiat in solutionis.
SIGNA.—Eye-wash.

Where there is atony, the following may serve a useful purpose:

121. ℞. Cuprii sulphatis, ... 0.25–1.0 gm. (gr. iij ad gr. xv)
Aquæ destillatæ, ... 100.0 c.c. (f℥ iij, f℥ j, ♏xl).
Misce et fiat in solutionis.
SIGNA.—Eye-wash.

If treatment is to be of any avail, the nose must not be forgotten. Polypi and other pathological conditions should be searched for and treated. Warm salt-water douches for the nasal cavities are said to be especially useful.

In addition to these modes of treatment care should be taken to remove all complications, such as blepharitis and chronic conjunctivitis, as much as possible. For this purpose, among other means, nitrate of silver in one or two per cent. strength solutions, and sulphate of zinc in two to three per cent. strength solutions, carefully applied and followed by cleansing of the conjunctival sac, are quite useful.

Silex[1] makes use of this treatment in the Royal Eye Clinic in Berlin. For injections, one per cent. strengths of zinc solutions are appropriate. Where the bones are involved, iodoform-glycerine has been recommended. If no improvement follows these measures, the tear-sac should be extirpated.

In some cases, the edges of the lids must be kept clean. In addition, they should be painted with a three per cent. strength solution of nitrate of silver

[1] "Deutsche medicinische Wochenschrift," 1891, Nr. 4, S. 141.

or, when not contraindicated, with a two per cent. solution of acetate of lead. For home use, a two per cent. strength Pagenstecher's ointment may be prescribed. If these procedures do not succeed, or if complications be present, the treatment must be modified. If there is considerable swelling over the tear-sac, the sac should be thoroughly cleansed and its mucous surface cauterized with either the nitrate of silver stick or the mitigated stick, the action of these cauterants being neutralized with chloride of sodium. At times, it may become necessary to slit up the anterior part of the sac between the two lacrimal canals, which have been previously opened, and the entire mucous surfaces cauterized with chloride of zinc paste. The same effect may be obtained with the galvano-cautery.

If lupus areas, tubercular masses, or polypoid hyperplasia (granulations of the lacrimal sac) be found, the anterior portion of the sac should either be excised and the remaining part removed with a sharp spoon, followed by the treatment above described, or the entire lacrimal sac is to be loosened from the periosteum and completely removed.

6. **Epiphora of Functional Type.**—In this condition, lacrimation is said, by Königstein, to occur, for example, at times in neuralgia of the supra-orbital branches.

In such cases, treatment should consist in quinine, salicylate of sodium, and antipyrine, with the employment of the constant current. Eventually, neurectomy may become necessary. General

nervousness and hyperemia of the nasal mucous membrane itself are also considered by some as a cause of lacrimation when the eyes are exposed to the action of the wind. In the first type of cases, cocaine is said to be serviceable. In the second, sternutatories and warm nasal douches have been found useful.

7. **Prelacrimal Cysts.**—Bock[1] reports such a case as a new formation. He considered such cysts as dermoid in character. Microscopically, they are found to contain fat-drops. Cure in these cases has followed instillations of tincture of iodine.

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[1] "Centralblatt für praktische Augenheilkunde," April, 1894.

CHAPTER VIII.

TREATMENT OF DISEASES OF THE CONJUNCTIVA.

As early as 1871, Schweigger[1] remarked that a strictly anatomic classification of these diseases could not be carried out in practice. In this statement he is correct, as although a pathologico-anatomic arrangement is easier for the ordinary understanding of such cases, yet it proves itself of very little value for purposes of practical treatment, which alone concerns such a treatise as this. For this reason, we do not find among authors an exact concordant separation between the pathologic varieties of the disease—such as hyperemia, catarrh, and inflammation. According to Schmidt-Rimpler,[2] catarrhal inflammation is characterized by increased secretion. If this be absent, he terms the condition catarrhus siccus. He devotes considerable space to hyperemia. Schweigger does the same. Michel, on the other hand, considers the subject only from a pathologic standpoint, while Königstein omits all classification. As the principles of the treatment are the same, we may consider the following together :

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[1] "Handbuch der speciellen Augenheilkunde," Berlin, 1871.

[2] "Handbuch der Augenheilkunde," Berlin, 1889.

1. HYPEREMIA OF THE CONJUNCTIVA AND SIMPLE CONJUNCTIVITIS.

(Catarrhal Conjunctivitis, Conjunctivitis Catarrhalis.)

While a considerable degree of hyperemia lies within the limits of a normal condition of the membrane, yet a point that must be considered as the departure from a healthy state is soon reached. This pathologic stage begins with the appearance of subjective symptoms; the first phenomena being pressure, burning or sticking, and a sensation of sand in the eyes, especially at night by lamp-light. If there is no secretion, simple hyperemia is being dealt with. If a mucoid secretion is superadded, the condition becomes one of catarrh. Both states may be acute or chronic.

The cause should first be investigated. Foreign bodies should be searched for, while disturbance of the lacrimal passages may render an examination of the nasal mucous membranes necessary. In older patients, the upper lids should be everted and calcareous infarcts of the Meibomian glands should be looked for. The refraction should be investigated, for frequently there is a hyperemia of the conjunctiva in progressive ametropia, though it should also be remembered that asthenopia may be a sequel of catarrhal conjunctivitis. It should also be noted whether the cilia and the lacrimal sacs occupy their normal positions. The general habits of the patient's life are to be investigated. Bad air, unsuitable light, insufficient sleep, prolonged strain of the

eyes—in fact, all unfavorable conditions, may prove themselves important causes, and offer fruitful fields for hygienic counsel.

In acute cases, cold applications, lotions, cold compresses, washes, and douches may be employed. For domestic use, the following are valuable:

122. ℞. Zinci sulphatis, ... 0|03 gm. (gr. $\frac{2}{5}$)
Aquæ destillatæ, ... 15|0 c.c. (f℥ iij et ♏lj).
(Schweigger.)

123. ℞. Plumbi acetatis neutralis, . . 0|025 gm. (gr. $\frac{9}{50}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
(Schweigger.)

124. ℞. Zinci sulphatis, ... 0|02 gm. (gr. $\frac{3}{10}$)
Aquæ destillatæ, ... 30|0 c.c. (f℥ vij, ♏xlj).
Misce et fiat in collyrium.
SIGNA.—Wash for conjunctiva. Use twice daily. (Fick.)

For local application by the surgeon, the same solutions in strengths of one to two per cent. can be used to advantage. In asthenopic types not dependent upon refractive errors, diluted tincture of opium has been recommended as an after-treatment.

In chronic cases without breakage of the corneal epithelium, fifteen per cent. strength lead-water has been advised. Six to ten drops in a wineglassful of boiled water are to be used on compresses two or three times a day for fifteen minutes at a time. The following ointments, particularly the latter, are also quite efficacious:

125. ℞. Hydrargyri chloridi corrosivi, . 0|003 gm. (gr. $\frac{3}{50}$)
Vaselini albæ (American), . . 10|0 gm. (℥ iiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyes.

126. ℞. Hydrargyri oxidi flavi, . . . 0|2 gm. (gr. ij)
Vaselini, ... 10|0 gm. (ʒiiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyes.

If there is increased secretion, as in acute cases, sulphate of zinc and acetate of lead (one-fourth per cent. strength each) or tannin in the proportion of one to thirty (Fick) may be used twice daily. It is a rule in employing remedies which are to be applied locally, that the applicator be a fresh one each time, for even the mucoid secretions may be infectious; this being further emphasized by the fact that both Koch and Weeks have found specialized bacteria in catarrhal conjunctivitis. Where there is an additional redness of the edges of the lids (blepharo-conjunctivitis), eye-washes are at times badly borne. In such instances, ointments should be used. Schweigger recommends oxide of mercury with a small quantity of oxide of zinc to which a few drops of acetate of lead have been added. This is to be applied at night, in the form of an ointment (see formula No. 89). In chronic cases of an eczematous nature, the following is recommended:

127. ℞. Ichthyol, ... 0|02–0|05 gm. (gr. $\frac{3}{10}$ ad $\frac{7}{10}$)
Amylis,
Zinci oxidi, ... āā 10|0 gm. (ʒiiss)
Vaselini, ... 25|0 gm. (ʒvj, gr. xxv).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment. (v. Sehlen.)[1]

Alum and aluminated copper may also be mentioned.

[1] "Deutsche Medizinal-Zeitung," 1895, S. 115.

In hyperemia of the palpebral conjunctiva Schmidt-Rimpler recommends that water douches at a temperature of 20° C. to 12° C. (68° F. to 53⅗° F.) should be employed several times daily from two to six minutes at a time. To the solution eau de cologne may be added, especially in cases in which there is severe pain with burning sensation. As an eye-wash for domestic purposes he prescribes:

128. ℞. Zinci sulphatis, ... 0|5 gm. (gr. vij)
Tincturæ opii, ... 1|0 c.c. (gtt. xv)
Aquæ destillatæ, ... 150|0 c.c. (f℥iv, f℥v)
Aquæ fœniculi, ... 50|0 c.c. (f℥j, f℥j, ♏xx).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

(Formulæ Nos. 2–8, 76–78, 143, and 145 may be used.)

If results are not achieved with this treatment, sulphate of zinc or tannin in one-fourth per cent. strengths may be instilled into the conjunctival sac at night, or the membrane may be touched with one to five per cent. strength solutions of the same drugs. For the pain, instillations of a two per cent. strength cocaine solution are at times indicated. Von Graefe has successfully employed equal parts of tincture of opium and distilled water for the same purpose.

In cases of hypersecretion of the conjunctiva, copper, two per cent. strengths of boracic acid, or acetate of lead may be used. Compresses may be employed or nitrate of silver in one-eighth per cent. strengths may be instilled to advantage. If desired, the membrane may be touched with a one-fifth of

one to two per cent. strength solutions of tannin or acetate of lead, or with the alum stick. One-half of one to one and a half per cent. strengths of nitrate of silver, followed by cold compresses for from one-quarter to one-half hour, are also serviceable. If eye-washes can not be borne, ointments such as the following, may be used:

129. ℞. Plumbi acetatis (neutralis), . 0|2 gm. (gr. $\frac{3}{10}$)
Unguenti paraffini, ... 8|0 gm. (℥ ij).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

In inflammation of the edges of the lids, lead-water and one-half of one per cent. strength of nitrate of silver solutions may be locally applied. For the subsequent treatment, glycerol, almond-oil, or lead-ointment (if there are no epithelial breaks in the cornea) may be recommended.

A few special indications are given by Königstein.[1] Conjunctival catarrh in measles, scarlet fever, and influenza are to be treated with cold compresses, applied three or four times daily for a quarter of an hour's duration at a time. If the edges of the lids are disposed to become adherent in the morning, they should be anointed the previous evening with some yellow oxide of mercury ointment or with cold cream or vaseline, and washed, upon rising in the morning, with a one per cent. strength solution of boracic acid. If there is no secretion (dry catarrh), alcoholic douches are to

1 "Die Behandlung der Augenkrankheiten," Wien, 1889.

be recommended. In chronic cases, Königstein employs the astringents already mentioned, and at times makes use of the copper or alum stick.

For the washing of the edges of the lids, the following solutions may be recommended:

130. ℞. Sodii biboratis, ... 1|0 gm. (gr. xv)
Aquæ laurocerasi, ... 5|0 c.c. (f℥i⅓)
Aquæ destillatæ,
Aquæ rosæ, ... āā 100|0 c.c. (f℥iij, f℥ij, ♏xliij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. Use as directed.

131. ℞. Alumen, ... 1|0 gm. (gr. xv)
Aquæ destillatæ, ... 200|0 c.c. (f℥iij, f℥iij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. Use as directed.

132. ℞. Sodii biboratis, ... 0|5 gm. (gr. vii$\frac{7}{10}$)
Aquæ destillatæ, ... 20|0 c.c. (f℥v, ♏viij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. To be instilled twice daily. (Förster, Greeff.)

133. ℞. Sodii biboratis, ... 0|5 gm. (gr. vii$\frac{7}{10}$)
Aquæ destillatæ, ... 20|0 c.c. (f℥v, ♏viij)
Auro-sodii chloratis, ... 0|03 gm.[1] (gr. $\frac{3}{50}$).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. To be instilled twice daily.

134. ℞. Cupri sulphatis, ... 0|1–0|2 gm. (gr. iss ad iij)
Aquæ destillatæ, ... 100|0 c.c. (f℥iij, f℥j, ♏xliij).

135. ℞. Cupri aluminatis, ... 0|05–0|1 gm (gr. $\frac{7}{10}$ ad iss)
Aquæ destillatæ, ... 120|0 c.c. (f℥iij, ♏v)
Tincturæ opii, ... 0|2 c.c. (♏iij)
Glycerini, ... 2|0 c.c. (f℥ss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

[1] "Handbuch der Arzneiverordnungslehre," 1883, S. 186.

136. ℞. Creolini, ... 0|25 c.c. (♏iii$\frac{1}{3}$)
Aquæ destillatæ, ... 100|0 c.c. (f℥ iij, f℥ j, ♏ xliij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. To be used three times daily.

Michel[1] uses a corrosive sublimate ointment, and

137. ℞. Hydrargyri chloridi corrosivi, . 0|003 gm. (gr. $\frac{1}{25}$)
Vaselini albæ (American), . . 10|0 gm. (℥ iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

ascribes to it a special protective power over the cornea. In hypersecretion, he advises an ointment of one-half to one per cent. strength of nitrate of silver. He also recommends the following ointment:

138. ℞. Plumbi acetatis, ... 0|05–0|01 gm. (gr. $\frac{7}{10}$ ad $\frac{1\frac{1}{2}}{10}$)
Vaselini, ... 10|0 gm. (℥ iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

Where the course of the disease becomes chronic, and the secretion is diminished, and if, in addition, there is a hyperplasia of the conjunctival papillæ, he thinks well of the following ointment:

139. ℞. Cupri sulphatis, ... 0|02–0|05 gm. (gr. $\frac{3}{10}$ ad $\frac{7}{10}$)
Vaselini, ... 10|0 gm. (℥ iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

In inveterate cases, he employs or touches the inflamed parts with the alum stick.

140. ℞. Tannin, ... 0|5 gm. (gr. viiss)
Vaselini, ... 15|0 gm. (℥ iij, gr. liij).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

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[1] "Handbuch der Augenheilkunde," 1890.

In acute and chronic inflammations of the conjunctiva Wicherkiewicz[1] recommends antipyrin. Shlösser[2] states that oxycyanide of mercury in one per cent. strength solutions, locally applied, is of value.

Hirschberg[3] advises (probably not for the purpose of being dogmatic, but to give an easily remembered rule to use in conjunctivitis) the use of one-half of a gram (gr. vij) strength of nitrate of silver to one cubic centimeter (f℥j) of distilled water. He states that one-tenth of a gram (gr. iss) to one hundred cubic centimeters (f℥iij, f℥j, ♏xliij) is of use in trachoma; while in purulent inflammation he uses two grams (gr. xxx) of the drug to one hundred cubic centimeters (f℥iij, f℥j, ♏xliij). We have, however, seen in obstinate cases, even in conjunctivitis, that one-fifth of one per cent. solutions of nitrate of silver may be necessary. His formulæ for sulphate of zinc solutions are somewhat similar:

141. ℞. Zinci sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 25|0 c.c. (f℥vj, ♏xxv).
Misce et fiat in collyrium.
SIGNA.—Eye-drops. Two drops at bedtime.

142. ℞. Zinci sulphatis, ... 0|25 gm. (gr. iii$\frac{4}{5}$)
Aquæ destillatæ, ... 25|0 c.c. (f℥vj, ♏xxv).
Misce et fiat in collyrium.
SIGNA.—Eye-drops. For penciling: ad usum proprium.

143. ℞. Zinci sulphatis, ... 0|25 gm. (gr. iii$\frac{4}{5}$)
Aquæ destillatæ, ... 250|0 c.c. (f℥viij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash. Apply on compresses three times daily for fifteen minutes at a time.

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[1] Hirschberg, "Centralblatt für praktische Augenheilkunde," April, 1892.
[2] "Bericht der Ophthalmologischen Gesellschaft," Heidelberg, 1893, S. 95.
[3] Hirschberg, "Einführung in die Augenheilkunde," 1892.

144. ℞. Zinci sulphatis, ... 0|01 gm. (gr. $\frac{3}{20}$)
Aquæ destillatæ, ... 5|0 c.c. (f℥j, ♏xvij).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

Königstein[1] states that it is the opinion of the ophthalmologists in Austria not to instil solutions into the eye at night, for at this time the conjunctiva is irritated to the highest degree, since always toward evening the inflammatory phenomena suffer an exacerbation. This, however, he considers is a mere prejudice. As confirmative, it is true that at noon and toward evening cold applications are the most grateful.

The use of smoked glasses is recommended by several writers,—as, for example, Meyer,—while on the other hand, it is opposed by such authorities as Michel. The middle ground, however, seems to be the proper one. In simple hyperemia of the conjunctiva and in dry catarrh, protective glasses are of great value, but they are harmful in cases of catarrh with secretion; this also being true of shades and bandages.

The constitution of the patient should receive attention, and general treatment should be instituted according to the nature of the case. Quinine, iron, and roborants, with massage, baths, and mineral waters, should all be prescribed. The physician is often at a disadvantage, because the patients only come for a single consultation in order to obtain a prescription.

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[1] "Behandlung der Augenkrankheiten," S. 25.

Du Bois Reymond uses as an eye-wash the following extemporaneous mixture:

145. ℞. Aquæ chlorini, one teaspoonful in a glass of water; aquæ sublimatis, 1 to 4000; acidi borici, 3 per cent.; sodii biboratis, 3 per cent., and soda, 1 per cent.

In chronic conjunctivitis, he employs:

146. ℞. Zinci sulphatis, ... 0|05–0|01 gm. (gr. $\frac{7}{10}$ ad $\frac{3}{20}$)
Aquæ destillatæ, ... 25|0 c.c. (f℥ vj, ♏xxv).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

147. ℞. Zinci sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 25|0 c.c. (f℥ vj, ♏xxv)
Cocainæ hydrochloratis, . . . 0|1 gm. (gr. iss).
Misce et fiat in collyrium.
SIGNA.—Eye-wash.

148. ℞. Zinci sulphatis, ... 0|1 gm. (gr. iss)
Vaselini albæ (American), . . 10|0 gm. (℥ iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

149. ℞. Cupri sulphatis, ... 0|1 gm. (gr. iss)
Vaselini albæ (American), . . 10|0 gm. (f℥ iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

2. CONJUNCTIVITIS BLENNORRHOICA.

In purulent or gonorrheal conjunctivitis may be found all grades of transition, from the severest form of ordinary catarrh to infectious inflammation. The cause is generally a transfer of some secretion of the urogenital tract to the conjunctival membrane. In pure cases, the element of contagion is the gonococcus of Neisser, which is always present at some period of the disease. The greatest danger of the disturbance

lies in any complication with the cornea and iris by which vision—apart from the reduction produced by corneal deformity, such as a leucoma—may be either more greatly injured or absolutely destroyed. Treatment is, therefore, of the greatest importance, especially when made use of during the early stages of the disease.

First of all is prophylaxis.[1] For the prevention of gonorrheal conjunctivitis in the new-born, Credé's method enjoys general confidence. It has, however, been modified so that the eyes of the new-born child are first cleansed with a one to three thousand per cent. strength solution of corrosive sublimate, followed by the instillation of a few drops of a two per cent. solution of nitrate of silver into each eye. This procedure produces no irritation of the conjunctiva and destroys the cocci in a few minutes'[2] time. Michel properly demands that the eye-dropper should be sterilized. This, however, is only necessary in hospitals. In private practice, new pipettes or one that has been kept immersed in a one to one thousand strength solution of bichloride of mercury, is sufficient.

Adults suffering from urethral or vaginal gonorrhea should be cautioned of danger of infection to the eyes.

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[1] According to the last reports of the Medical Section of the Silesian Society ("Berliner klinische Wochenschrift," Nr. 12, 1895, S. 268), there were two hundred and fifty cases of blennorrhea among twelve thousand new-born in Breslau during the year 1894.

[2] Cohn, Breslau, "Centralblatt für praktische Augenheilkunde," 1895, S. 107.

Schmidt-Rimpler has observed a case of infection in gonorrhea produced by nose-glasses which the wearer had touched with his infected fingers, and thus carried the pus to the eye. As an antiseptic, he recommends chlorine-water. If the disease attacks one eye, protection of the other must be instituted. In the new-born this is chiefly a matter of care, and it is the duty of the physician to properly direct this. As the constant attention which is required is too great for one nurse, and as so much is dependent upon such care, it is important that relief at proper intervals be given. The favorable results of treatment depend in many cases, as Königstein justly remarks, upon the conscientious work of the attending nurse. Frequent cleansing of the diseased eye at regular intervals, and a proper position of the child, so that any secretion does not flow toward the healthy organ, are the special factors in the treatment of the case. In adults, the healthy eye should be protected by a simple bandage, which should be renewed once or twice daily ; or, better, it should be covered by means of a mica-shell or a watch-crystal, which is fastened in position by means of cotton and collodion. The watch-crystal is to be warmed before using, so that no vapor will be deposited upon it. If neither of these articles are at hand, a bandage of boracic acid lint and salicylated cotton will temporarily suffice. Fuchs closes the fissures of the lids by means of vertically placed strips of isinglass plaster. Over this he places some cotton pledgets of lint, which are

securely fastened by means of the plaster to the margin of the orbit. Michel leaves the healthy eye open, but closes the diseased one, the bandage of which is to be frequently renewed. He exercises the greatest caution to see that the second eye remains free from secretion.

The rule for the treatment of the diseased eye during the first stage of the disease is to make cold applications in the form of ice-compresses. These may be combined with antiseptic solutions. In the eye-clinic of the University of Munich, a one to five hundred strength solution of oxycyanate of mercury is instilled into the conjunctival sac. This solution corresponds to one of corrosive sublimate of the strength of one to two thousand, without having the irritating properties of the latter. Fuchs uses a one to four thousand strength corrosive sublimate solution. He also employs either a two per cent. strength of boracic acid or a one per cent. strength of permanganate of potassium, a few drops of the latter being added to the water. During the first few days subsequently every hour, and still later, less frequently, the conjunctival sac should be irrigated with these solutions, the physician employing cotton or an Undine syringe for the purpose. All soiled cotton should be thrown into a vessel containing some strong phenol-solution. Every two hours a little chlorine-water should be instilled into the conjunctival sac. During the first few days, swelling of the lids and chemosis of the conjunctiva are apt to be very marked, giving rise at times to severe pain. Should these con-

ditions appear, five or six leeches applied to the temple, with meridional scarification of the chemotic conjunctiva, will be found useful. In cases of severe tension of the lids, with pressure on the bulb, splitting the outer canthus for about one-half a centimeter's distance, partly in order, by bleeding, to relieve the inflamed condition of the lids, and partly to mitigate pressure on the bulb, may be recommended. This effect can be still further increased by massage (Schmidt-Rimpler). Finally, in order to prevent hyperemia of the iris, one drop of a one per cent. strength solution of atropine should be instilled thrice daily. This constitutes the treatment for the first three or four days' time. It should be carried out morning, noon, and evening by the physician himself.

When the disease enters into the stage of exudation, it becomes necessary to modify the treatment, especially since the cornea is in danger. Treatment with astringents, especially, should be instituted. For such purposes, nitrate of silver becomes useful. It is to be remembered (Schweigger)[1] that inflammation and danger of the participation of the cornea in this stage can be greatly increased when such treatment is instituted at too early a period. It is better to wait a few days, and begin first with a one-half of one per cent. strength solution of nitrate of silver; and if this strength is well borne, it should be increased to two and three per cent. strength solu-

[1] Saemisch is of the same opinion. Graefe und Saemisch, "Handbuch der gesammten Augenheilkunde," 1895, Band IV, S. 92.

tions. Schweigger considers the solid stick, and even the mitigated one, contraindicated, because they are apt to leave scars upon the conjunctiva. In severe cases, Schmidt-Rimpler recommends the mitigated stick, the conjunctiva being touched but once a day. According to other authorities,—Königstein, for instance,—the application should be made twice a day. Above all, it is important to lessen the burning pain after each application by means of cool compresses.

Throughout this period, the patient needs remedies that are intended for the alleviation of pain. For this purpose, instillations of cocaine, or, better, inunctions with cocaine-vaseline-ointment, may be employed. For any excoriation of the eyelids produced by constant moisture, recourse must be had to almond oil, vaseline, or lanolin.

Differing from this method is the treatment suggested by Michel.[1] From the first day of the disease he uses a corrosive sublimate ointment of three one-thousandth parts to ten of vaseline, and instils some one or two per cent. strength solution of nitrate of silver into the conjunctival sac once or twice daily. After the sixth day, he employs the mitigated stick, and touches the entire conjunctival fold, and even the posterior portions of the tarsal conjunctiva, with it. He repeats this treatment every third day. If improvement follows, solutions of nitrate of silver are used in place of the stick.

In the employment of one per cent. strengths or

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[1] "Lehrbuch der Augenheilkunde."

two per cent. strengths of nitrate of silver solutions, it is important to exercise caution not to irritate the corneal surface, the epithelium of which is at all times in danger of breakage. The chief complication is in ulceration of the cornea. If this occurs, the cold compresses should be continued, although at other times in corneal diseases cold is contraindicated. If the ulcer becomes deeper, paracentesis of the cornea should be performed, so as to prevent spontaneous perforation. In order to guard the anterior lens-capsule against the secretions, it is advisable to instil eserine previously, as otherwise any suppuration might extend to the crystalline lens. In especially severe cases, the entire cornea becomes infiltrated with pus, melts away, and permits the lens to escape. In such instances, the process may be shortened by opening the lens-capsule. In other cases, prolapse of the iris occurs, which, if extensive, may be removed with a knife or a scissors.

In gonorrheal ulcer of the cornea, Ehrenthaler[1] prefers the use of salicylate of eserine and chlorine-water to corrosive sublimate and atropine, believing that ocular circulation is rendered more favorable by eserine.

The treatment of chronic blennorrhea is different. In such cases, a change of the applications becomes advisable. Especially is this so in the case of the employment of nitrate of silver solutions in order to prevent argyrosis of the conjunctiva. The copper

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[1] "Münchener medicinische Wochenschrift," 1892, Nr. 38.

or alum stick, also solutions of acetate of lead and sulphate of zinc, particularly in the form of eye-washes, are to be recommended. For domestic use,

150. ℞. Zinci sulphatis, ... 0|03 gm. (gr. $\frac{2}{5}\frac{5}{0}$)
Aquæ destillatæ, ... 15|0 c.c. (f℥iij, ♏v).

151. ℞. Argenti nitratis, ... 0|025 gm. (gr. $\frac{1}{5}\frac{2}{0}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).

however, acetate of lead should not be used in cases in which there is ulceration of the cornea. If there is a mucoid secretion, ointments also may be employed (Saemisch)—

152. ℞. Cupri sulphatis, ... 0|2 gm. (gr. iij)
Vaselini, ... 10|0 gm. (℥iiss);

and in pannus—

153. ℞. Argenti nitratis, ... 0|4 gm. (gr. vj)
Aceti plumbi, ... gtt. iv
Unguenti paraffini, ... 8|0 gm. (℥ij).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment. To be used daily as directed.

More recently, Burchardt[1] has instituted a noteworthy modification in the treatment of blennorrhea, which is said by him to have yielded much more favorable results than any methods that have heretofore been employed. He claims for this method that it removes the cause of the disease—Neisser's gonococcus—from the conjunctiva, while under other modes of treatment, though the inflammation be combated, the cause remains. From this standpoint, he asserts

[1] "Centralblatt für praktische Augenheilkunde," Nov., 1893, und März, 1894.

that although cold and ice-compresses are useful, they do not kill the cocci, and may act harmfully on the cornea. It is also stated that scarification of the conjunctiva and employment of leeches likewise are of little value.[1] His method of treatment is as follows: Finding that the irritation induced by a two per cent. strength solution of nitrate of silver is useless, he has an assistant pour some of the following solution into the inner canthus while the physician performs massage movements several times a second with the thumb placed on the skin of the cheek beneath the lower lid.

154. ℞. Argenti nitratis, ... 0|8 gm. (gr. xij)
Aquæ destillatæ, ... 500|0 c.c. (Oj).
Misce et fiat in collyrium (in vitro fusco).
SIGNA.—Eye-wash.

In the case of the upper lid, the index and the middle fingers of the other hand are to be used.

This massage or kneading of the lids incidentally also removes the inflammatory edema and constitutes what the author terms "emptying of the conjunctival sac." It should be continued for about one minute's time and sufficient of the drug should be used until the material employed comes away clean. This procedure should be performed four times daily. During the intervals, compresses of a five per cent. strength solution of chlorine-water are to be applied. When corneal ulcers are present, pressure should not be

[1] Berlin and Fick are of the same opinion. They also consider ice harmful, and prefer lukewarm compresses of boracic acid solution with mild antiseptics.

exerted on the eyeball. Burchardt does not employ prophylactic bandaging of the healthy eye, but examines the organ previous to the treatment of the diseased one and lightly cleanses its conjunctival sac with nitrate of silver of the strength of one to one thousand.

The following formulæ of von Graefe [1] may also be used:

155. ℞. Extracti hyoscyami, ... 1|0 gm. (gr. xv)
Aquæ rosæ, ... 30|0 c.c. (f℥vij, ♏xliv)
Aquæ calcaria,[2] . . . . . 100|0 c.c. (f℥iij, f℥j, ♏xliij)
Hydrargyri chloridi mite, . . 0|6 gm. (gr. ix).
Misce et fiat in collyrium.
SIGNA.—Eye-water for blennorrhea.
(Aqua ophthalmica nigra.) (von Graefe.)

156. ℞. Hydrargyri chloridi mite,
Stibii sulphurati aurantiaci,
Pulvi conii, ... āā 0|06 gm. (gr. $\frac{4}{5}$)
Sacchari albæ, ... 0|5 gm. (gr. vij).
Misce et fiat in pulvis numero xij.
SIGNA.—One powder two to four times daily. (von Graefe.)
(Pulvis antiscrophulosus.)

157. ℞. Zinci sulphatis, ... 0|2 gm. (gr. iij)
Aquæ destillatæ, ... 12|0 gm. (℥iij)
Mucilaginis gummi arabici, . 4|0 gm. (℥j)
Tincturæ opii crocatæ, . . . 2|0 c.c. (f℥ss).
Misce et fiat in collyrium.
SIGNA.—To be used once or twice daily.

Concerning a new method of procedure by Kalt, of Paris, see the foot-note.[3]

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[1] "Handbuch der Arzneiverordnungslehre," 1883, S. 381 und 700.

[2] German Pharmacopeia.

[3] At the 1895 Ophthalmological Congress at Heidelberg, Kalt (see Abstract of Graefe and Horstmann, "Deutsche medicinische Wochenschrift," Sept. 5,

3. CROUPOUS AND DIPHTHERITIC CONJUNCTIVITIS.

For purposes of treatment, a differentiation of these two forms of conjunctival inflammation is not absolutely necessary. Although scarlet fever and diphtheria are the most frequent causes of these types of inflammation, yet the conditions may also appear under other circumstances, particularly in poorly nourished children during the first years of life.

In the therapy, the same principle holds good as in blennorrheal inflammation, as far, at least, as antisepsis, cleanliness, and cauterization of the inflamed mucous surfaces, with protection of the healthy fellow eye, are concerned. Prognosis, however, is less favorable.

Schweigger[1] and Saemisch insist that cauterization of the conjunctiva during the early stages of the disease should not be made. They state that only after the membrane has loosened can the use of nitrate of silver be instituted. They begin with one-half to one per cent. strength solutions and

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1895, S. 151) reported concerning the treatment of blennorrhea with irrigation of the conjunctival sac, by means of a small, specially adapted glass funnel, so arranged that the medicament does not touch the corneal surface. He uses a one to three thousand strength solution of permanganate of potassium three times daily, one (Oij) to two liters (Oiv) being employed at a time. A cure results in about twelve days' time. The same favorable result was achieved in serpentic ulcer and granular conjunctivitis. He keeps the irrigator at a height of about one-half a meter from the eye. Nothing is said concerning the temperature of the solution.

[1] "Handbuch für gesammten Augenheilkunde," 1891, Graefe und Saemisch.

gradually increase them to two and three per cent. strengths. In the older manuals of ophthalmology, mercurialization, with calomel and gray ointment, in addition to bleeding and incision of the infiltrated portions of the conjunctiva, are recommended. Cold compresses are not always well borne, and warm ones may have to be employed—indeed, it becomes necessary in every case to individualize the special variety of medication.

Königstein washes the conjunctival sac with warm boracic acid solutions, for which purpose, however, other antiseptics may be substituted. In Northern Germany, cleansing solutions of one to five thousand strength of corrosive sublimate are in favor.

Massage of the everted conjunctiva, with three per cent. strengths of yellow oxide of mercury ointment may be useful. If the cornea is threatened, atropine may be instilled. Hoppe [1] reports favorable results in diphtheria of the conjunctiva and lids with infiltration of the cornea, by the local use of atropine, three per cent. strengths of yellow oxide of mercury ointment, ice, and injections of Behrings' serum and antitoxine. Similar results are recorded by Recken.[2] Jessop [3] has used distilled water locally with injections of antitoxin serum with equally good results. Hirschberg employs chlorine-water and nitrate of silver in two per cent. strength solutions.

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[1] "Deutsche medicinische Wochenschrift," Nr. 12, 1895.

[2] "Centralblatt für praktische Augenheilkunde," Aug., 1895.

[3] "Wiener medizinische Wochenschrift," Nr. 12, 1895.

4. FOLLICULAR CATARRH.

Under unfavorable hygienic conditions, and also in institutions where many, especially children, are crowded together,—as, for instance, schools and orphanages, or in barracks,—lymphoid and conjunctival follicles situated on the temporal half of the conjunctival sac of the lower lid are often seen. In most of these cases, any conjunctivitis with its purulent secretion is contagious. Wash-basins and towels may be the carriers of the infection. During an epidemic of the disease in an orphanage at Aschaffenburg, Michel found a special form of diplococcus. Follicular catarrh may also follow the prolonged use of atropine. It was formerly assumed that atropine was the cause of the condition, which, however, should not be confounded with atropine idiosyncracy, that is characterized by pain immediately after the primary employment of the drug. At present, it is fully recognized that contamination with bacteria renders atropine solutions carriers of germs that may give rise to infectious inflammation. The same phenomena are observed during the employment of eserine solutions.

Harmful symptoms are not always present in follicular catarrh, nor can the presence of follicles be always considered as pathologic. They are very often present, but all do not come necessarily under treatment, and no special injury need follow their non-recognition. Overzealous physicians have, however, at times, insisted upon the closing of

schools or of classes, or have excluded every affected child from participation in instruction. Bacteriologic examination, with ordinary sanitary measures, offers the best hygienic plan.

Since the follicles are so frequent, it is not surprising to find them as an accompaniment of some other type of ocular inflammation. Naturally, marked cases may occur in which complaint of severe burning and pricking is made, and in which inflammatory conjunctival swelling with muco-purulent secretion is present.

Treatment, therefore, is to be mainly governed by the intensity of the morbid process. Of prime importance are hygienic measures, consisting in the separation of the well and the sick, in disinfection of linen, and in scrupulous cleanliness.

Among remedies, astringents are used. This is particularly so in the north of Germany. If the secretion is more mucoid, sulphate of zinc may be employed; if it is purulent, nitrate of silver is useful. Of special value is a solution of a two per cent. strength of boracic acid. The still frequently used stick of sulphate of copper should be discarded. Michel recommends corrosive sublimate vaseline-ointment[1] combined with massage two or three times daily. He advises that the large follicles should be incised and expressed with the thumb and

[1] ℞. Hydrargyri chloridi corrosivi, . . 0|003 gm. (gr. $\frac{1}{25}$)
Vaselini albæ (American), . . . 10|0 gm. (℥iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

index-finger. Birnbacher[1] recommends, if necessary, the cleansing of the conjunctiva with solutions of trichloride of iodine in one to one thousand strengths. This is to be done under the use of cocaine. Von Hippel[2] wipes off the conjunctiva with a one to two thousand strength of corrosive sublimate solution.

5. SPRING CATARRH (Frühjahrscatarrh).

Michel finds that this form of follicular catarrh is neither more frequent in the spring nor is it associated with any special catarrhal phenomena. The follicles are most often found in the palpebral-fissure zone. It is characteristic of this condition (with which also the tarsal conjunctiva is affected), that it may persist for months or even years, and may be associated with tumefaction of other lymphatic glands.

For treatment, the corrosive sublimate vaseline-ointment with massage is recommended. Michel suggests that the applications should be made every second or third day by the physician himself. The pressure, which should be light, is to be made on the upper lid by stroking or rotary movements continued for at least five minutes at a time. The large follicles should be removed with a sharp spoon. Iron and iodide of iron taken internally, are to be

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[1] "Centralblatt für praktische Augenheilkunde," 1895, S. 96.

[2] "Bericht der Ophthalmologischen Gesellschaft," Heidelberg, 1892, S. 96.

ordered. Arsenic may be recommended, but it does not seem to enjoy special reputation. Mild local treatment is to be advised, as, for example, solutions of boracic acid.

Wicherkiewicz[1] uses antipyrin in five to ten per cent. strength solutions. Fick recommends the following formula:

158. ℞. Zinci sulphatis, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 30|0 c.c. (f℥vij, ℥xlij).
Misce et fiat in collyrium.
Signa.—Eye-drops.

Smoke, heat, dust, and impure air must be avoided. Schmidt-Rimpler recommends only the mildest astringents. When there is much sensitiveness to light, all authors are agreed on the value of blue or smoked glasses as a protection.

6. EXANTHEMATOUS CONJUNCTIVITIS (Ophthalmia Exanthematosa).

Diseases of the conjunctiva are frequent concomitants of general conditions, such as measles, scarlet fever, erysipelas, varicella, variola, ecthyma, and herpes zoster. The cornea may be affected in all of these conditions. Usually, however, hyperemia or catarrh of the bulbar conjunctiva may also be present.

The treatment is both general and local. For the latter, boracic acid and an ointment of corrosive

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[1] "Centralblatt für praktische Augenheilkunde," April 1, 1892.

sublimate and vaseline, with cold compresses and a darkened room, are all valuable:

159. R. Hydrargyri chloridi corrosivi, . 0.001 gm. (gr. $\frac{1}{66}$)
Vaselini, ... 5.0 gm. (℥j, gr. xvij).
Misce et fiat in unguentum.
SIGNA.—Ointment for eye.

7. CONJUNCTIVITIS PHLYCTÆNULOSA.

This is one of the most frequent and, therefore, one of the best known of ocular diseases. On account of the associated disease of the cornea and its intense irritative phenomena, such as photophobia and blepharospasm, the disease is of great importance, especially since it generally attacks the subject during childhood and adolescence. Bacteriologically, it appears as if the staphylococcus pyogenes albus (Rosenbach) were the chief factor in the disorder.

Despite the fact that the disease is pathologically clearly differentiated, appearing in the form of vesicles, pustules, infiltrations, and nodules, especially in the scleral conjunctiva, its nomenclature is extremely varied. It is known under the name of scrofulous, phlyctenular, or exanthematic conjunctivitis, and herpes of the conjunctiva, in Northern Germany, while in Southern Germany, it is designated as pustulous or lymphatic phlyctenular conjunctivitis. The diagnosis is easy, though rarely, a patch of episcleritis may be confounded with a phlyctenule.

Treatment is general, and consists, in great measure, in getting the patients to live in a pure atmos-

phere. Special attention should be devoted to the hands of sick children ; also to the face, the clothing, and the bed-linen. From time to time, a sojourn in the open air, as the weather permits, is valuable. Ordinary warm or saline baths are useful. It has been frequently observed that children who have suffered from long-continued phlyctenular blepharospasm have immediately lost the spasm and the photophobia after receiving the first cleansing bath in the hospital. In some instances, however, the blepharospasm has continued. Such cases are to be treated by repeated immersions in cold water several times daily. Whether the parents of such children, who frequently belong to the peasant class, carry this treatment sufficiently into effect, is questionable. Cocaine should also be used, and the living room of the patient should be darkened on account of photophobia. The following prescription is useful :

160. ℞. Cocainæ hydrochloratis, 0|1–0|05 gm. (gr. iss ad gr. $\frac{5}{10}$)
Vaselini, ... 3|0–5|0 gm. (gr. xlvj ad ʒj, gr. xvij).

v. Graefe[1] prescribes the following ointment for the forehead :

161. ℞. Opii pulvis, ... 2|5 gm. (gr. xxxviij)
Extracti hyoscyami, ... 1|2 gm. (gr. xviij)
Unguenti hydrargyri cinerei,[2] 15|0 gm. (ʒiij, gr. lj).
Misce et fiat in unguentum.
SIGNA.—To be used as directed.

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[1] "Handbuch der Arzneiverordnungslehre," von Ewald und Lüdecke, 1883, S. 514.

[2] German Pharmacopeia.

The local remedies generally used are the preparations of mercury. There is, however, no unanimity of opinion. While some prefer corrosive sublimate in proportions of 0.003 gm. (gr. $\frac{1}{25}$) to 10 gm. (℥iiss), or Pagenstecher's ointment in strengths of 0.1 gm. (gr. iss) to 10 gm. (℥iiss) (Michel), others recommend calomel highly. Experience, indeed, teaches that with this last drug recent phlyctenulæ are most rapidly cured, the yellow oxide of mercury ointment being more suitable for domestic use and after-treatment. In broad phlyctenulæ, the ointment is, as a rule, more valuable than the powder. Daily use of lead-water compresses with atropine are also recommended, the latter having a favorable influence on any blepharospasm. During the employment of calomel preparations, syrup of the iodide of iron is contraindicated. In ulcerating phlyctenulæ and inflammation of the conjunctival fold (Schwellungscatarrh), cold applications and astringents in one to two per cent. strength solutions are useful. A favorite method is to alternately use one of the astringents one day and the yellow oxide of mercury ointment the other. The treatment is the same in pannus phlyctenulosus. The after-treatment consists in the use of calomel for weeks in order to prevent any recurrence of the condition.

Concerning the employment of atropine in spasm of the lids with photophobia, it should be remembered that some authors contend that the atropine action is only attained after the irritative phenomena

have subsided, and they doubt the *post hoc ergo propter hoc* reasoning (Königstein). No matter whether this may be so or not, the advice of this author, to prescribe ointments only after the lacrimation and the spastic closure of the lids frustrate the effect of solutions, is good. Hirschberg[1] uses atropine and cocaine in solution.

For compresses, chlorine-water, in addition to the lead-water, is also recommended. For a long time this plan of treatment in phlyctenular disease has been employed by A. von Graefe.

162. ℞. Aquæ chloratæ,[2] . . . . . 100|0 c.c. (f℥iiiss).
SIGNA.—Tablespoonful in one liter (Oij) of water. To be used on compresses three or four times daily from fifteen to thirty minutes at a time.

162*a*. ℞. Aquæ chloratæ,[2]
Aquæ destillatæ, . . . āā 10|0 gm. (f℥iiss).
SIGNA.—To be used for instillation two or three times daily.

Others recommend one-half of one to one per cent. creoline solutions, and antipyrine in ten per cent. solutions. These drugs, however, are as yet not very extensively employed.

Fick's[3] rule is to perform massage with yellow oxide of mercury ointment the morning of one day, followed the next day during the forenoon by the use of nitrate of silver solution, 0.2 gm. (gr. iij) to 10 gm. (f℥iiss). In the afternoon of each day, he uses sulphate of zinc solutions.

In keratitis, he recommends solely—

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[1] "Deutsche medicinische Wochenschrift," 1895, S. 111.

[2] German Pharmacopeia.

[3] "Handbuch der Augenheilkunde," 1894.

163. ℞. Atropinæ sulphatis, ... 0|1 gm. (gr. iiss)
Vaselini, ... 10|0 gm. (ʒiiss).
Misce et fiat in unguentum.
SIGNA.—Poison. Eye-ointment.

Or—

℞. Atropinæ sulphatis,
Cocainæ hydrochloratis, . . āā 0|1 gm. (gr. iss)
Vaselini, ... 10|0 gm. (ʒiiss).
Misce et fiat in unguentum.
SIGNA.—Poison. Eye-ointment.

"Yellow salve," as it is termed, is best prescribed in the following form:

163*a*. ℞. Hydrargyri oxidi flavi, . . 0|1–0|2 gm. (gr. iss ad iij)
Lanolini,
Vaselini albæ (American), āā 5|0 gm. (ʒi¼).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment. (Schweigger.)

In large clinical services, it is best to have the yellow oxide of mercury ointment made into small paper cones that may be thrown away after use. The preparation can be applied with small glass rods. As a rule, the use of the ointment should be combined with massage. In about a quarter of an hour's time after the employment of the drug, the eyes should be cleaned with lukewarm water or chamomile tea. Nodules that do not soften under this treatment may be touched with the mitigated stick or with a two per cent. strength solution of nitrate of silver, or with tincture of opium. If a phlyctenule threatens to involve the deeper corneal tissue, it may be cauterized. If eczema of the lids and face is present, antiseptic solutions should be employed,

and since in such cases, scrofula usually exists, a proper general treatment should be instituted.

Burchardt's[1] method is as follows: The conjunctival sac should be irrigated daily with chlorine-water, five to one thousand strength, or with nitrate of silver solution, one to one thousand strength. Calomel is to be applied locally two or three times daily, or, if desired, white precipitate ointment may be used. The yellow oxide of mercury should not be employed because it irritates. In deep corneal infiltrations, the galvano- or actual cautery is of value. Eczema of the face should be treated with a three per cent. strength solution of nitrate of silver.

The following ointments may be employed:

164. ℞. Olei cadini, ... 1|5 gm. (gr. xxiij)
Zinci oxidi, ... 4|0 gm. (ʒj)
Vaselini, ... 10|0 gm. (ʒiiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

165. ℞. Hydrargyri præcipitatæ albæ,[2] 0|5 gm. (gr. viiss)
Zinci oxidi, ... 5|0 gm. (ʒj, gr. xvij)
Vaselini, ... 10|0 gm. (ʒiiss).
Misce et fiat in unguentum.
SIGNA.—Ointment for eyelids.

Meat diet, wine, and beer, according to the nature of the case, should be prescribed. The nasal[3] and the pharyngeal cavities should receive attention,

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[1] Vortrag in der Berliner Ophthalmologischen Gesellschaft am 15. März, 1894.

[2] German Pharmacopeia.

[3] Hirschberg recommends deodorized iodoform, 0|5 gm. (gr. viiss), and vaseline, 10|0 gm. (ʒiiss), as an ointment for the nose.

especially after rubeola, scarlatina, and pertussis. In addition, the parts should be cleansed with cotton and astringents in solutions or ointments. In these cases, Schmidt-Rimpler recommends the well-known Plummer's powder (see formula 156, v. Graefe) and an ointment for the nose (see formulæ 85, 86, 87).

Pemphigus of the Conjunctiva.—This condition is rare, even in cases of general pemphigus. The cornea is usually affected. As the conjunctiva is apt to contract in the late stages of the condition, entropium or symblepharon may be produced.

Treatment consists in the use of either boracic-acid-vaseline ointment or corrosive sublimate ointment, three or four times daily, with arsenic internally.

8. EPIDEMIC CATARRH (*Schwellungscatarrh*).

The newer manuals distinguish this form of conjunctival disease as a condition that is intermediate between catarrhal conjunctivitis and blennorrhea. In addition to the swelling of the retrotarsal fold of the conjunctiva, it is characterized by a virulent secretion. In consequence, epidemic manifestations of the disease are found. The catarrh is either primary or it is secondary to phlyctenular and corneal disturbance.

Treatment consists in the application of antiseptic compresses, the instillation of chlorine-water, and the application of solutions of tannin, with the internal

administration of laxatives. When the local swelling has subsided, astringents can be applied.

9. TRACHOMA.

This form of conjunctival affection also enjoys a multiplicity of names: Trachoma, conjunctivitis trachomatosa or granulosa, Egyptian ophthalmia, conjunctivitis militaris, blennorrhea chronica, follicular blennorrhea, and conjunctivitis follicularis.

Nearly all authors, among them Schmidt-Rimpler, Schweigger, and Fuchs, state that under the term of ophthalmia militaris, a number of different forms of conjunctival affections are classed.

The clinical manifestations of this infectious and widely disseminated disease of the conjunctiva, complicated often with disturbance of the cornea, are well known, and it is merely necessary to refer to a few points in the differential diagnosis and the practical aspects of the condition.

If trachoma of the conjunctiva were always seen as it is described in the text-books, with its frog-spawn-like or gelatinous granulations, the diagnosis and treatment would be easy. This, however, is not the case, as is evidenced by the nomenclature. In addition, trachoma may be confounded with lymph-follicles, that accompany phlyctenular and catarrhal conjunctivitis, especially among children. These lymph-follicles have not rarely been mistaken for Egyptian ophthalmia, especially in schools, and have been actually treated with the copper stick.

Michel also calls attention to the fact that, more frequently than believed, the tubercle bacillus produces the clinical picture of trachoma.

In such cases, the etiologic factors must be taken into consideration. Trachoma develops by preference under unfavorable hygienic surroundings, in which lack of cleanliness plays a part, as in overcrowded dwellings, and also in certain districts that are particularly prone to its formation, such as the rural districts of Hesse (Schweigger), in Eastern Prussia, and in Vienna. It is also seen among the Czech population (Königstein), but by no means in the higher seminaries. If granulations appear in such institutions, they are lymph-granules, and are to be treated with calomel or boracic acid solutions, or zinc and cocaine, but not with copper.

Schwellungscatarrh has also given rise to confusion on account of its epidemic nature.

In the treatment, the distinction between the acute and the chronic forms of the disease must be borne in mind. It must also be remembered whether the condition presents itself in the guise of granulations or whether it appears as a diffuse or a mixed type of trachoma (Stellwag).

One of the hygienic measures is to inform the relatives and friends of the patient concerning the marked contagiousness of the disease, and to explain to them that personal cleanliness is the most important factor in the treatment. The patient should have his own towels and washing utensils. His sleeping apartment should be kept

scrupulously clean. If the trachoma is acute, in the form of granulations, the treatment is primarily mechanical. The granulations may be either scraped off, scarified, squeezed out with the finger-nail, or treated with electrolysis or the cautery. The method of Knapp, of New York, with the so-called "roller forceps,"[1] is highly to be recommended. The sharp spoon is not advised because it produces too great a loss of substance and gives rise to irregular cicatrization, with unfavorable influence upon the tarsus (Königstein). Michel recommends the method in marked papillary proliferation.

Another form of operative treatment is where the whole fornix conjunctivæ is excised. This procedure was particularly in vogue in Königsberg, especially during the years 1880 to 1890, and at first gave quite satisfactory results. Later, however, cicatricial contractions diminished any permanent favorable effect.

The chief remedies in acute granulations, after the greatest number have been mechanically removed, are the copper preparations and nitrate of silver, combined with corrosive sublimate vaseline-ointment as an adjuvant (Michel).

1. In severe conditions of irritation, associated with swelling of the lids, cold compresses are indicated. Some authorities recommend lead or boracic acid solutions; others use corrosive sublimate water

[1] "Centralblatt für praktische Augenheilkunde," Oct. 1, 1892; July 1, 1893.

in strengths of one to ten thousand, or various strengths of permanganate of potassium. Sattler's solution—boracic acid, 15|0 gm. (ʒj, gr. xlv) and salicylic acid, 1|0 gm. (gr. xv), in 500|0 c.c. (fʒ xv, fʒ viiss) of distilled water—has also been recommended. This solution, however, is expensive.

Rest for the eyes, even when the patient is in a dark room, is recommended. Cold compresses, with painting of the edge of the lids with nitrate of silver or acetate of lead, is spoken of by Schmidt-Rimpler. The following instillation may also be used:

166. ℞. Aquæ chloratæ, ... 20|0 c.c. (fʒ v).
SIGNA.—Eye-drops.

2. After the irritation has subsided, mild astringents, such as tannin, acetate of lead, sulphate of zinc, and boracic acid in powder form,[1] once or twice daily, should be employed. If the secretion is marked, nitrate of silver, first used in one per cent. strength, and, if well borne, followed by a two per cent. strength solution, is to be used. Cold applications for one-half hour at a time should be used immediately afterward.

3. If irritation increases and ciliary pain and iritic phenomena appear, bleeding from the temples, in association with the use of atropine and cocaine, is indicated. The latter drug, however, should not be employed too freely, because it may lead to a drying and a desquamation of the corneal epithelium (Königstein).

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 310.

4. If inflammation is absent because the condition has become chronic or because it has been devoid of inflammatory phenomena, or if there is no secretion, then, especially in diffuse trachoma, the copper stick should be used daily. After this is done, some authorities advise the employment of cold compresses. On the contrary, others do not use them because they have found that the pain seemed to be aggravated by their employment.

167. ℞. Cupri sulphatis, ... 0|5 gm. (gr. viiss)
Aquæ destillatæ,
Glycerini, ... āā 10|0 gm. (f℥iiss).
Misce et fiat in collyrium.
SIGNA.—Eye-drops.

168. ℞. Cupri sulphatis, ... 0|05–0|15 gm. (gr. $\frac{7}{10}$ ad ij)
Vaselini, ... 5|0 gm. (℥i¼).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.[1]

5. If the phenomena become milder and the secretion ceases, and at the same time if the conjunctiva is paler and dryer, the alum stick with moist warmth is indicated.

6. Should the cornea participate (pannus keratitis), moist warmth, with atropine, should be used. Should the condition be mild and the corneal tissue but slightly hazed, the copper stick should be continued.

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[1] The following formula by Hirschberg may be used in the place of formula 168:

℞. Cupri sulphatis,
Cocainæ hydrochloratis, . . . āā . 0|25 gm. (gr. iij)
Unguenti glycerini, ... 10|0 gm. (℥iiss).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

If, on the other hand, the pannus is dense and obstinately resists all treatment, either scarification of it or peritomy of the cornea is indicated. If necessary, galvano-caustic destruction of the larger vessels may be tried.

If there is danger of blindness, various authors recommend the artificial production of an acute blennorrhea with gonorrheal secretion. Others (de Wecker) induce an artificial jequirity ophthalmia by means of the ferment of the Brazilian *Abrus precatorius*, which is produced by maceration of the husked and powdered grains for two or three hours' time. The procedure has been described by Schmidt-Rimpler. These measures seem extremely heroic, and are not practicable in private practice.

As trachoma tries the patience of the physician, as well as that of the affected subject, in the highest degree, and since in no other disease, a change of remedies is so useful, a few that enjoy popularity in Southern Germany may be advantageously named. Michel prefers massage of the conjunctiva with an ointment of corrosive sublimate and vaseline, 0.003 gm. (gr. $\frac{1}{25}$) to 10 gm. (℥iiss). In cases in which the treatment has been begun with mechanical extirpation of the papillary granulations, the after-treatment should also consist in the use of corrosive sublimate vaseline-ointment. This ointment also deserves recommendation in cases in which, after contraction and cicatrization, a xerotic condition of the conjunctiva remains.

Somewhat recently, Schwabe[1] (Leipzig) claims to have cured the most obstinate cases in a few weeks' time by a simple surgical procedure which he terms *blepharochalasis*, which consists in the excision of oval pieces from the skin of the upper and lower lids, with an incision at the outer canthus.

This reminds us of the statement of Saemisch ("Lehrbuch von Graefe und Saemisch," 1875, Band IV, S. 74) that, by the simple enlargement of the outer canthus by an incision, remarkable curative effects are often obtained, even in corneal processes of long duration, the lessening of pressure being the chief factor in the good result.

The sequelæ of contraction of the conjunctiva, such as entropium and blepharophimosis, demand surgical interference. Schmidt-Rimpler mentions ectropium as a sequel of the condition.

After it is seen how the treatment of trachoma is taught in some of the manuals of ophthalmology, it may be of interest to investigate how the treatment has been modified in different countries.

Beginning with those places that are known to have a large percentage of trachoma, it will be found that the method of Sattler[2] (Prague) for dispensary patients is as follows: After cocainization or narcosis and irrigation of the parts with corrosive sublimate solutions, the follicles are scratched with a cataract needle and scraped clean with a sharp

[1] "Deutsche medicinische Wochenschrift," 16. Mai, 1895, Nr. 20, S. 317.

[2] Supplement of "Centralblatt für praktische Augenheilkunde," 1891, S. 508.

spoon. To do this properly, a special form of double forceps for seizing the upper lid is necessary. In old cases, deeper scarification is employed. Irrigation with a one per cent. strength corrosive sublimate solution is next followed by the placing of corrosive sublimate compresses upon the lids. In three or four days' time the operative wounds are healed. The after-treatment consists in the use of a two per cent. strength of nitrate of silver or corrosive sublimate solution. Tannin solution is also praised as useful in the after-treatment. Pannus is treated with yellow oxide of mercury ointment.

In Russia, as stated by Schröder,[1] the mechanic treatment of trachoma consists in brushing the contents of the trachoma-granulations clean by means of a metal brush. The subsequent treatment consists in the use of corrosive sublimate solutions in one to six thousand strength. In Hungary, as reported by Regimental Surgeon Klein,[2] chromic acid crystals held in an iris-forceps are applied to the granulations. This procedure is followed by immediate washing with sterile water. The after treatment consists in calomel dusting.

169. ℞. Hydrargyri chloridi mite, . . 1.0 gm. (gr. xv)
Sacchari albæ, ... 5.0 gm. (℥i¼).

In Germany, massage with cotton, after the method of Keining,[3] is especially recommended. Birnbacher[4] employs trichloride of iodine solutions,

[1] *Ibidem*, 1893, p. 410.
[2] *Ibidem*, 1893, p. 524.
[3] *Ibidem*, 1893, p. 435.
[4] *Ibidem*, 1893, p. 553.

in one to one thousand strengths, instead of the corrosive sublimate solutions, believing that they act more certainly and do not produce any discomfort. Volkmann's spoon, discredited at many clinics, was greatly praised at the Ophthalmological Congress held at Palermo.

In France, Trousseau[1] considers curetting not advisable, preferring to brush the granules with pumice-stone or to use pledgets of cotton dipped in corrosive sublimate solution. He also believes that Knapp's roller forceps is of value, and says that the instrument should be frequently employed, though he does not dispense with later active applications of corrosive sublimate solution.

Abadie[2] prefers scarification, with subsequent brushing. La Grange[3] (Bordeaux) scarifies with a knife and follows this procedure by scraping with a sharp spoon. He does not consider the method of brushing as satisfactory as scraping, and has devised a special spoon with sharply serrated edge for the purpose. After using this instrument, he employs the brush, and, finally, makes use of corrosive sublimate solutions.

In the United States of America, Clairborne[4] (New York) is an advocate of punctiform galvanocauterization. In that country, the roller forceps of Knapp[5] (New York) enjoys great popularity. As

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[1] *Ibidem*, 1895, p. 96.

[2] *Ibidem*, p. 456.

[3] *Ibidem*, p. 476.

[4] *Ibidem*, p. 483.

[5] Gessner, Warschau, "Centralblatt für praktische Augenheilkunde," October, 1892.

the name indicates, the instrument consists of a forceps with finely fluted rollers, by means of which the trachoma-granulations are easily crushed.

The procedure is said to be less painful than that of Keining's method. The conjunctiva must, of course, be previously cocainized. Two days after the operation, the conjunctiva is brushed with some one or two per cent. strength nitrate of silver solution, the membrane being repeatedly washed with a one to ten thousand strength corrosive sublimate solution. Scott[1] (Cairo) paints the palpebral conjunctiva with a four per cent. strength solution of oxycyanide of mercury, and instils a quarter of one per cent. strength or a one to one thousand proportion solution of this agent into the conjunctival sac some three or four times.

Kozlowsky[2] (Poland), after expressing the granulations, uses antipyrin and corrosive sublimate combined for the after-treatment. Wicherkiewicz,[3] in chronic cases, employs twenty-five per cent. strength antipyrin solutions. Legros[4] (Brussels) praises a strong methyl-violet solution (pyoktanin), of two to seventy-five parts. Ottava[5] (Budapest) employs active massage with an ivory rubber or a wooden spatula. In this last method, under the process of active rubbing, the trachoma-granulations burst, and

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[1] "Deutsche Medicinal-Zeitung," 1895, S. 115.

[2] Supplement to "Centralblatt für praktische Augenheilkunde," 1893, S. 518.

[3] *Ibidem*, S. 544.

[4] *Ibidem*, S. 528.

[5] "Centralblatt für praktische Augenheilkunde," July, 1893.

their contents are then washed out with a one to five thousand strength solutions of corrosive sublimate. In Keining's method[1] the washing and the rubbing of the outer as well as of the inner surfaces of the palpebral conjunctiva with a two per cent. strength corrosive sublimate solution, is but the first part of the treatment, to which should be joined a slitting of the trachoma-granulations and an expression of their contents. The presence of irritation of the iris is a contraindication. The treatment is to be performed once or twice daily for about from two to six weeks' time. When there is active secretion, nitrate of silver, with the subsequent use of copper, is to be substituted.

10. LUPUS, SYPHILIS, TUBERCULOSIS, LEPROSY, AND AMYLOID DEGENERATION OF THE CONJUNCTIVA AS CONCOMITANT OF CONSTITUTIONAL DISEASE.—XEROSIS CONJUNCTIVÆ.

The treatment of these conditions, apart from the use of antisyphilitic remedies, is similar in all: the sharp spoon, with the use of nitrate of silver. Galvano-cauterization and extirpation of the hyperplasias are also recommended. The after-treatment, especially in ambulatory cases, consists in the use of iodoform.

170. ℞. Iodoformi, ... 1|0 gm. (gr. xv)
Vaselini, ... 15|0 gm. (gr. lj).
Misce et fiat in unguentum.
SIGNA.—Eye-ointment.

[1] Supplement, *ibidem*, 1893, pp. 507 and 516.

Xerosis of the Conjunctiva.—This condition is characterized by dryness, with atrophy and contraction of the conjunctiva (xerophthalmus squamosus seu totalis, Schmidt-Rimpler). A parenchymatous form of this disease is, as a rule, the result of severe blennorrhea or granular conjunctivitis.

Treatment.—Warm water or lead-water compresses and the instillation of glycerol have been recommended. Almond oil and solutions of the alkaline carbonates are also used.

Michel employs three to five per cent. strengths of boracic acid vaseline or corrosive sublimate ointments ; Schmidt-Rimpler uses warm compresses and salicylic acid solutions ; Saemisch recommends moist warmth, with protective dressings. In severe cases, he instils milk into the conjunctival sac.

11. TUMORS AND MALPOSITION.

These conditions of the conjunctiva demand surgical treatment. It is important, however, to remember the possibility of serious hemorrhages following operation for their removal in children.

Among the tumors may be mentioned telangiectasis, lymphangioma, subconjunctival lipoma at the outer canthus (teratoid tumors [Michel], also termed ichthyosis hystrix), dermoids, and polypi at the inner canthus or at the lacrimal caruncle. In advanced life, sarcoma, epithelioma, and melanoma may occur. Cysts and cysticercus vesicles may also be found. Even after the removal of only a part of the cyst-

wall in these latter cases, the employment of nitrate of silver on the remaining portions is said to give protection against recurrence.

The well-known *pinguecula* at the corneal margin demands no special treatment, though, should there be a desire to have it removed, this can be readily done under cocaine.

Among the easily classed forms of disturbance of the conjunctiva the following may be mentioned:

(*a*) **Pterygium.**—This affection is well known, and offers no special difficulties in diagnosis. The treatment is operative. As a prophylactic measure in peripheral ulcerations of the cornea, astringents and cold compresses should be employed. As a rule, the cause is external irritation, such as dust. It is found among mechanics, cigarmakers, masons, and stone-workers in general. It also arises from burns and lesions of the corneal margin. Old persons are especially predisposed to the condition.

(*b*) **Symblepharon.**—This condition consists of adhesions between the tarsal fold of the conjunctiva and the scleral conjunctiva. For relief, it demands surgical treatment alone. Among the various means advised to endeavor to prevent it, are the frequent drawing away of the lid, instillations of oil, packing with boracic acid lint, and the insertion of compresses dipped in oil and isinglass.

(*c*) **Conjunctival Hemorrhages.**—These occur in traumatism, pertussis, vomiting (rarely), in atheroma, in emphysema, and from sudden increase in

blood-pressure. In the severe cases, the treatment consists in the use of a pressure-bandage.

(*d*) **Chemosis.**—Acute hyperemia of the conjunctiva occurs chiefly in suppurative chorioiditis. It may also appear as an inflammatory edema in acute abscesses of the neighboring parts, as, for example, in dacryo-adenitis. Treatment consists in scarification.

12. WOUNDS AND FOREIGN BODIES IN THE CONJUNCTIVA.

In all cases of this kind, the retrotarsal folds, especially that of the upper lid, should be everted and carefully searched, if possible, with a Daviel's spoon. If this is impracticable, the mucous surface in this situation should be pencilled with a swab of moist cotton and flushed with a warm solution of boracic acid.

Wounds and Burns of the Conjunctiva.—In regard to prognosis and treatment, small wounds offer nothing of importance. Large ones demand sutures. In burns of the conjunctiva, the treatment varies somewhat with the cause, whether it be from hot metal, from glass-splinters,—as, for example, in workers in glass factories,—or from acids or alkalies. Mild burns or corrosions are not productive of any disturbance,[1] though at times, questions in regard to legal points become involved.

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[1] "Aggravation bei Augenverletzungen," Ohlemann, "Zeitschrift für Medicinalbeamte," 1894.

The treatment is antiphlogistic, and consists, as a rule, in the application of mild antiseptic solutions. In corrosions produced by acids, solutions of carbonate of soda are recommended. When they are the result of alkalies, milk, above everything, is extremely valuable. Free irrigation, however, in these cases is useful.

Burns produced by lime should be treated with oil and concentrated solutions of sugar (Fuchs).[1]

Michel[2] recommends to mechanically remove any lime, sand, or mortar particles from the everted lids. This is to be followed by cleansing the conjunctiva with a brush or mop dipped in olive oil. Later, boracic acid vaseline-ointment should be applied at frequent intervals. The after-treatment consists in the use of cold compresses, moist bandages, and the frequent withdrawal of the eyelids from the eyeball to prevent adhesions. Any resulting symblepharon and diplopia are to be treated by operative measures.

CHAPTER IX.

TREATMENT OF DISEASES OF THE CORNEA.

A. DISEASES OF THE CORNEAL EPITHELIUM.

In the arrangement of the diseases of the cornea, the author will adhere to the teachings of Michel.

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[1] "Lehrbuch der Augenheilkunde," 1889, S. 114.

[2] "Lehrbuch der Augenheilkunde," 1890, S. 692.

In few mucous membranes does the epithelium play such a rôle as in the cornea. The cause is an anatomic one—namely, the superficial position of the terminal nerve-endings and their exposure after a slight loss of the protecting epithelium. Another important point in injury to the epithelial layer is the consequent danger of infection. This is all the greater as pus-foci are not rare in the neighborhood of the cornea (*i. e.*, conjunctiva and lacrimal sac), and, indeed, grave corneal suppuration is often produced thereby (hypopyon-keratitis).

1. **Defects of the Corneal Epithelium.**—Among the usual causes are roughness of the tarsal conjunctiva (meibomitis) and calcareous concretions which act like foreign bodies. In fact, all forms of irregularities of the conjunctiva are produced by various diseases of this membrane. These conditions generally lead to a catarrhal inflammation situated at the margin of the cornea. The treatment demands protective covering of the exposed corneal surface, for which purpose, corrosive sublimate vaseline-ointment is best adapted. If necessary, a protective bandage may also be used, though it is not necessary to keep it applied both day and night, as experience has shown that if it is worn simply for a few hours during the day it produces excellent results.

2. **Pannus.**—This condition consists in a proliferation of the epithelium that converts the smooth corneal surface into a roughened one. The ordinary cause is the formation of blood-vessels in con-

sequence of inflammatory reaction. Hence, pannus phlyctenulosus, trachomatosus, and traumaticus are all spoken of. Treatment naturally consists in the removal of the cause.

In trachomatous pannus, Schmidt-Rimpler[1] especially recommends, in addition to the usual treatment of the trachoma (*vide* formulæ 23–25, 167, 168), Guthrie's ointment.

171. ℞. Argenti nitratis, ... 0|4 gm. (gr. xij)
Aceti plumbi, ... gtt. viij
Vaselini, ... 8|0 gm. (℥ij).
Misce et fiat in unguentum.
SIGNA.—Ointment for eye.

Michel advises massage with mercury ointment. Among the mechanical procedures, punctiform galvano-cauterization and touching the affected area with a pointed stick of nitrate of silver are recommended. In the severest forms of the condition, operative treatment has been advantageously substituted for medical therapy. It should be remembered, however, as has been pointed out by Saemisch,[2] that a frequent change of medicaments is valuable; likewise temporary suspension of treatment is of use.

In phlyctenular pannus, oxide of mercury (formulæ 162–165), combined with massage, is frequently sufficient.

Special attention should be given to the edges of the lids, since extremely fine cilia may be the cause of the condition. Where the lids themselves are

[1] "Augenheilkunde," 1889.

[2] "Handbuch der gesammten Augenheilkunde," von Graefe und Saemisch, 1875.

the causative factors, as, for example, in meibomitis, entropium, or ectropium, they must be treated. If ulcers are responsible, as at times is the case in tubercular disease of the conjunctiva, they should be excised or scraped clean with a sharp spoon. The after-treatment is best effected by one of the following formulæ:

172. ℞. Iodoformi, ... 5|0 gm. (ʒ ii¼).
(Place in glass.)
SIGNA.—To be used for the eye.

Or—

℞. Iodoformi, ... 0|5 gm. (gr. viiss)
Petrolati, ... 10|0 gm. (ʒ iiss).
Misce et fiat unguentum.
SIGNA.—Eye-ointment.

Vascularization of the cornea during the healing process of corneal diseases responds very well to moist warmth. If shrinking of the conjunctival membrane occurs, Schmidt-Rimpler recommends the frequent instillation of warm milk. The following formulæ are also valuable:

173. ℞. Sodii carbonatis, ... 0|3 gm. (gr. iv)
Aquæ destillatæ, ... 50|0 gm. (f ʒ j, f ʒ v).
Misce et fiat collyrium.
SIGNA.—Eye-drops.

173*a*. ℞. Acidi borici,[1] . . . . . 0|3–0|5 gm. (gr. iv–vij)
Petrolati, ... 10|0 gm. (ʒ iiss).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. (Michel.)

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[1] Rabow prescribes—

℞. Acidi borici, ... 5|0 gm. (ʒ i¼)
Lanolin, ... 20|0 gm. (ʒ v)
Petrolati, ... 30|0 gm. (ʒ vij, gr. xlij).
Misce et fiat unguentum.
SIGNA.—Ointment for eye.

3. **Keratitis phlyctænulosa** (clinical synonyms: keratitis eczematosa, pustulosa, lymphatica, scrofulosa).—Pathologically, this condition is spoken of as marginal phlyctenulæ, fascicular keratitis, and as circumscribed or superficial corneal infiltration.

Treatment is primarily general, since the disease usually affects subjects that are scrofulous or those who are living in bad hygienic surroundings. Stress should be, therefore, laid upon pure air and cleanliness of person and home. Michel advises against the employment of dark rooms, goggles, and shades. If the patient be a child, its hands and face should be cleansed several times daily. Bed linen, particularly pillow-cases, should be frequently renewed, since the little patient generally lies with its face buried in the pillow—a habit that should be discouraged. The nasal cavities should be kept clean and the face should be washed with clean water whenever the child has a tendency to rub its eyes.

Wholesome diet, such as milk, fresh meat, eggs, etc., should be given, and, in accordance with indications, iodide or lactate of iron with lime and other ferruginous preparations, should be ordered. Small doses of iodide of potassium are also to be recommended.

Local Treatment.—In recent cases, cold applications three or four times daily, from one-quarter to one-half hour each time, should be made. Antiseptics are not necessary; at least, not in ordinary dispensary cases, as the use of such materials seem to complicate

home-treatment. For such purposes it is sufficient to employ cold boiled water. If it is desired to use such remedies, boracic acid—half a teaspoonful dissolved in a glass of water, or chlorine-water, a teaspoonful to a teacupful of water—may be used. Cold compresses are indicated because the general conjunctiva is usually simultaneously affected, and they are soothing. The prescribing of large quantities of antiseptic solutions is to be deprecated in favor of the asepsis of abundant boiled water and thorough cleanliness, as the patients are for the most part poor.

The chief remedies are atropine, two or three times daily, and yellow oxide of mercury in strengths of two-tenths to one hundred of vaseline. The ointment is rubbed into the skin of the eyelid for several minutes at a time. It is the ordinary practice in the Royal Eye Clinic in Berlin to employ acetate of lead in the proportion of ten drops to an ordinary water-glassful of boiled water for compresses. In addition, yellow oxide of mercury ointment, 0.2 gram to 10.0 grams (gr. iij ad ʒiiss) of vaseline is to be used for rubbing into the skin of the eyelids in the morning and in the evening. In Munich, the ointment is smeared into the conjunctival sac in a thick layer, and the little patients are sent home with the eye covered by a cotton pad and a gauze bandage.

If irritation, such as photophobia or blepharospasm, is present, immersion of the face in cold water, cold compresses, and hydrochlorate of cocaine may be used. The immersions are, however, only

valuable when they are frequently made. The cocaine is more advantageous in these cases if it is employed in the form of an ointment rather than in solution. Königstein's formula is very good:

174. ℞. Cocainæ hydrochloratis, . . 0.1–0.2 gm. (gr. iss ad iij)
Petrolati, ... 3.0 gm. (gr. xlvj).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. To be used several times daily.

Atropine should be employed when a small pupil points to iris-irritation. Tepid chamomile tea, compresses, and warm baths are valuable. If the condition is complicated by conjunctivitis or by swelling of the conjunctival fold, cold-compresses may be employed and the conjunctival membrane painted with the astringents described in formulæ 13–22, and the parts subsequently rinsed with water. If facial eczema and rhinitis exist, both being associated with lacrimation, treatment with ointments spread on pieces of cloth or boracic lint, or painted on the affected portions with a mop of absorbent cotton, may be used. Iodoform ointment, 0.5 gram to 100.0 grams (gr. vij ad ℥iij, ℥iss), zinc or tar vaseline, or Hebra's ointment for the face, all enjoy deserved popularity. Under the application of nitrate of silver in solution, or with the stick, excoriated parts heal rapidly.

In phlyctenular pannus, yellow oxide of mercury ointment or calomel is indicated.

McGillivray[1] (Dundee) recommends an ointment of atropine, 0.05 gram (gr. $\frac{7}{10}$), yellow precipitate

[1] "Centralblatt für praktische Augenheilkunde," 1894, S. 391.

0.1 gram (gr. iss), cocaine, 0.15 gram (gr. ii$\frac{1}{10}$), and vaseline or lanolin, 8.0 grams (℥ ij).

If eczema or severe conjunctivitis exist, cloths dipped in oil are to be laid upon the lids and covered with cold compresses (Schmidt-Rimpler).

Rhagades produced by blepharospasm and lacrimation demand the use of the nitrate of silver stick. This treatment should be followed by the application of ointments, such as boracic acid, zinc, or Hebra's ointment, with subsequent massage. If irritative phenomena are absent,—that is, if there is no lacrimation or photophobia, — calomel is an excellent general remedy, and should be employed for several weeks after apparent recovery, since relapses are very prone to occur. Should convalescence be prolonged and calomel not be well borne, yellow oxide of mercury ointment may be substituted (Königstein). In this stage, calomel itself may produce irritation, and it is, therefore, important to study all individual characteristics.

In chronic pannus without irritation, the yellow oxide of mercury ointment, combined with massage, is of value. Steam or warm compresses in the form of tea-infusions, are also of use.

In pannus efflorescens, the elevated points should be touched with an electric needle. Especially is this so in cases of fascicular keratitis or in cases in which vascular bands (keratitis fasciculosa, Schmidt-Rimpler) are present. Calomel or the yellow oxide of mercury ointment should be tried first. If the electric needle fails, Königstein's [1] method deserves a trial.

The eye is first cleansed with a one to five thousand strength solution of corrosive sublimate. It is then cocainized, and the center of the vascular band extending to the corneal edge is scraped clean with a sharp spoon. Iodoform is then dusted on and a bandage is applied. This procedure is particularly indicated when galvano-cauterization is for any reason not applicable.

Corneal opacities remaining from pannus keratitis necessitate the use of clarifying agents, such as the yellow oxide of mercury ointment and calomel, combined with massage, for long periods of time. These opacities should receive careful attention, because any residuary cicatrices may serve as the starting-point for the development of new infiltrations and new blood-vessels (cicatricial keratitis, Schweigger; keratitis in macula recurrens, du Bois Reymond).

Purulent infiltration of the deeper layers of the cornea are indications for the use of atropine and the application of tepid chlorine-water compresses, employed three times daily for half an hour at a time. Chlorine-water should also be instilled into the conjunctival sac. During the intervals, moist pressure-bandages should be applied.

When the corneal infiltration is seen in adults, calomel will be found to be unquestionably better than the yellow oxide of mercury ointment. As there is always considerable irritation in such cases,

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[1] "Die Behandlung der Augenkrankheiten," Wien, 1890.

atropine, cocaine, and moist pressure-bandages are indispensable.

Instead of using the yellow oxide of mercury ointment or calomel, dermatol, europhen, aristol, and the following formula which has recently been recommended in pannus may be employed:

175. R. Europhen, ... 0.1 gm.[1] (gr. iss)
Unguenti aquæ rosæ, ... 3.0 gm. (gr. xlvj).
Misce et fiat unguentum.
SIGNA.—Eye-ointment.

4. **Herpetic Diseases of the Cornea.**—Several forms of inflammation that are variously grouped by different authors are to be considered under this head. Simple herpes of the cornea (keratitis vesiculosa) is differentiated from keratitis bullosa. The first variety is also described as catarrhal, febrile, or inflammatory herpes, or herpes zoster and herpes neuralgicus. These different designations merely, as a rule, indicate the different causes.

In the treatment, Schmidt-Rimpler is guided by the condition of the conjunctiva. If the secretion is excessive, he applies tannin or acetate of lead in solution. Warm compresses he considers as contraindicated. Cold ones, however, applied for half an hour at a time three times daily, he believes are of great value.

If there is iris-irritation, atropine should be used. If the ciliary region is tender to pressure, several

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[1] "Centralblatt für praktische Augenheilkunde," 1892, Oktoberheft 'Petersburg Bericht,' Kubli.

(five, as a rule) leeches should be applied to the temple, and Arlt's [1] ointment may be employed. If conjunctivitis is absent, moist warm compresses are preferred. The vesicles of the cornea are treated with calomel. In most cases of recurrence, the constant current, pressure-bandages, and even ablation with the scissors, are indicated. Pressure-bandages are said to be capable of permanently preventing any further eruption of vesicles (Graefe-Saemisch, Band IV, Theil 2, S. 234).

Michel treats the disease similarly to eczematous inflammation, with corrosive sublimate vaseline-ointment, antiseptic protective bandages, atropine, and the constant current. Emmert [3] (Bern) employs warm corrosive sublimate solution and eserine. In severe cases, he has found that pressure-bandages and galvano-cauterization are useful.

In keratitis bullosa, the local treatment consists in puncture or ablation of the wall of the vesicle, with the application of a bandage and boracic acid vase-

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[1] 176. ℞. Unguenti hydrargyri ammoniati,
Extracti belladonnæ, . . aa 10 gm. (gr. xv)
Petrolati, ... 10 gm. (℥iiss).
Misce et fiat unguentum.
SIGNA.—Ointment. To be rubbed on the temple and forehead daily

Or—

177. ℞. Unguenti hydrargyri cinerei,[2]
Petrolati, ... aa 5 gm. (℥i¼)
Extracti belladonnæ, ... 1 gm. (gr. xv).
Misce et fiat unguentum.
SIGNA —Ointment. To be rubbed on temple and forehead daily.

[2] German Pharmacopeia. (Unguentum hydrargyri ammoniati (U. S. P.) can be substituted.)

[3] "Centralblatt für praktische Augenheilkunde," Dec., 1892.

line-ointment. Severe pain demands the use of narcotics as well as the avoidance of all irritation. Oil may be instilled.

B. INTERSTITIAL OR PARENCHYMATOUS INFLAMMATIONS.

Under this head are classified those corneal diseases which are described as keratitis interstitialis, keratitis parenchymatosa, keratitis diffusa, keratitis profunda, and anterior uveitis. Pathologically, a distinction is to be made between the vascular and the avascular forms, the terminal results of which are characterized by the production of opacities in the corneal tissue. Schweigger distinguishes keratitis parenchymatosa profunda or interstitialis and keratitis punctata. Michel notes a difference between primary parenchymatous inflammation with a high-grade circumcorneal injection that is frequently complicated with inflammatory processes in the iris, and a secondary parenchymatous inflammation,—sclerokeratitis,—which is complicated with scleritis. Schmidt-Rimpler speaks of keratitis diffusa and sclerosing corneal infiltration.

The causal factors govern the treatment. Dyscrasias, such as syphilis, scrofula, and anemia, are usually present. In rare cases, nutritional disturbances, associated with articular disease, malarial cachexia, and diabetes, are found.

The treatment, therefore, is both general and local. It is important in the beginning to inform

the patients that the disease is of long duration, but that the prospects for cure are good.

In cases of syphilis, an appropriate therapy is to be instituted. Since the patients are usually young, and are nearly always victims of hereditary syphilis (Fuchs), a daily dose of gray ointment for inunction should be given, as a rule, one gram (gr. xv). According to most authorities, the conjoint administration of iodide of potassium is very important.

Attention should also be bestowed upon the general nutrition, which should be improved by means of roborants. If the patients are strong, pilocarpine may be employed. Warm baths are also of value. In the local treatment, a distinction, according as irritative phenomena are present or absent, should be made. If such conditions exist, atropine is indicated. Among authors, opinion is divided as to the value of warm compresses. If the stage of irritative phenomena has not been present, or if it is past, absorbing remedies are applicable. These, however, should not be used too early, and in the beginning of their use, should be employed with caution, in order to avoid the production of any new or fresh irritation. It is best to continue the remedies with massage.

If irritative phenomena are present, such as lacrimation, photophobia, and circumcorneal injection, and if the irritative state is protracted, the process may be shortened by puncture of the anterior chamber or by an iridectomy. The author has seen cases in which, the external circumstances demanding accel-

eration of the treatment, an iridectomy has produced a rapid cure. Recurrence, however, has taken place, but the attacks were lessened by puncture of the cornea through into the anterior chamber. Among formulæ of absorptive agents are the following:

178. ℞. Hydrargyri chloridi mitis, . . 5|0 gm. (ʒi¼)

179. ℞. Hydrargyri oxidi flavi, ... 0|1 gm. (gr. iss)
Petrolati, ... 5|0 gm. (ʒi¼).
Misce et fiat unguentum.
SIGNA.—Ointment for eye.

180. ℞. Unguenti hydrargyri cinerei,[1] 3|0 gm. (gr. xlv)
Lanolini, ... 3|0 gm. (gr. xlv)
Petrolati, ... 6|0 gm. (ʒiss).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. (Mitvalsky.)[2]

181. ℞. Potassii iodidi, ... 0|1 gm. (gr. iss)
Sodii bicarbonatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Petrolati, ... 3|0 gm. (gr. xlvj).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. (Königstein.)

The most recent iodine preparation is iodide of rubidium. It is said to produce the same results as the potassium salt, but it is purported to have less influence upon the heart when it is given internally. As an eye-wash it may be used in the following form:

℞. Rubidii iodidi, ... 0|5 gm. (gr. viiss)
Aquæ destillatæ, ... 10|0 c.c. (fʒiiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops. (Bunge.)[3]

Treatment of the Infiltration.—There is a special

[1] German Pharmacopeia. (Unguentum hydrargyri ammoniati, U. S. P. can be substituted.)

[2] "Centralblatt für praktische Augenheilkunde," Februar, 1892.

[3] Merck, 'Bericht über das Jahr 1893,' S. 35.

class of cases that are characterized by circumscribed infiltrations. In many clinics, these cases have, before 1890, been treated by galvano-cauterization or by puncturing. Schöler [1] cauterizes the limbus cornea in diffuse keratitis, and does likewise in central infiltrations, especially when there are several distinct circumscribed areas. The procedure is the more effective the earlier it is applied. The remaining treatment, even in cases of scrofula, consists in the use of mercurial inunctions, with iodide of potassium

182. ℞. Potassii iodidi, ... 14|0 gm. (ʒ iiiss)
Dissolve in half a liter (Oj) of water. Teaspoonful at a dose.

internally; also in the use of atropine and, locally:

182*a*. ℞. Potassii iodidi, ... 1|0 gm. (gr. xv)
Aquæ destillatæ, ... 10|0 c.c. (fʒ iiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops.

183. ℞. Hydrargyri biniodidi,[2] . . . 0|3 gm. (gr. iv)
Potassii iodidi, ... 3|0 gm. (gr. xlvj)
Aquæ destillatæ, ... 30|0 c.c. (fʒ vij +).
Misce et fiat collyrium.
SIGNA.—Five drops three times daily. (v. Graefe.)

184. ℞. Pilulæ creosoti, ... 0|05 gm. (gr. $\frac{7}{10}$).
SIGNA.—One pill three times daily.

In the absence of irritation, it is recommended to touch the retro-tarsal fold of the conjunctiva with the mitigated stick twice weekly in order to hasten absorption.

Since, in these cases it is often necessary to con-

[1] "Berliner klinische Wochenschrift," 1892, Nr. 10, Albrand.

[2] German Pharmacopeia. (Hydrargyri iodidum rubrum, U. S. P.)

tinue the use of atropine for a long period of time, it is important to bestow some attention on the preparation of the atropine solution. Until the "Nineties" it was the usual practice to order simply:

185. ℞. Atropinæ sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 5|0 c.c. (f℥ i¼).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

186. ℞. Atropinæ sulphatis, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

187. ℞. Atropinæ sulphatis, . . . 0|02–0|08 gm. (gr. $\frac{3}{10}$ ad j)
Aquæ destillatæ, ... 8|0 c.c. (f℥ ij).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

As a bacteriologic examination of solutions thus prepared has shown that in a very brief time they have swarmed with bacteria, it has become necessary to protect them against contamination by means of steam-sterilization (Hirschberg) or by association with corrosive sublimate in strengths of one to five thousand or one to ten thousand strength (von Franke).

188. ℞. Atropinæ sulphatis, ... 0|5 gm. (gr. viiss)
Liquoris hydrargyri
chloridi corrosivi (1 : 5000), 5|0 c.c. (f℥ i¼).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison ! !

189. ℞. Atropinæ sulphatis, ... 0|1 gm. (gr. iss)
Liquoris hydrargyri
chloridi corrosivi (1 : 10,000), 10|0 c.c. (f℥ iiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

Scopolamine may be used in proportionate strength instead.

190. ℞. Sodii sozoiodolici,[1] . . . 0|25–0|5 gm. (gr. iii¼ ad viiss)
Atropinæ sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Petrolati, ... 10|0 gm. (℥iiss).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. (Goldzieher.)[2]

Cocaine or pilocarpine may be substituted for the atropine.

In France, Italy, and Holland, good results are said to have been obtained in specific cases with subconjunctival injections of corrosive sublimate (solutions of one to ten thousand, eight drops to be used at one dose[3]) (see Chap. III).

Wallace[4] recommends aristol as a clearing agent. In powder form it does not irritate either the cornea or the conjunctiva. (The author has not seen any improvement from the use of this drug.)

Keratitis Punctata.[5]—This form of disease, which is also a variety of inflammation of the corneal tissues, is to be separated from parenchymatous keratitis proper. It is characterized by punctiform whitish infiltrations, and may be complicated with iritis and posterior synechiæ.

In the treatment, the use of atropine is demanded. In cases of syphilis, iodide of potassium is also to be

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[1] German Pharmacopeia.

[2] "Centralblatt für praktische Augenheilkunde," März, 1894, S. 79.

[3] "Centralblatt für praktische Augenheilkunde," Supplementheft, 1892, S. 475 (la Grange).

[4] "The Therapeutic Gazette," February, 1892.

[5] Writers distinguish keratitis punctata superficialis (Fuchs), profunda, punctata, post operationes, scrophulosa zonularis, macularis, nummularis (Stellwag). "Wiener medicinische Wochenschrift," 1891, Nr. 25 und 26, Königstein, 1890.

used, while in scrofula, iodide of iron becomes necessary. Otherwise, the same principles should be followed as have been described at length under the section on Parenchymatous Keratitis. Of special value are warm solutions of boracic acid, dark glasses. After all irritation has subsided, yellow oxide of mercury ointment and massage are of use. Finally, sodium sozoiodolicum (formula 190) should be employed.

Atropine is always indicated. Should it fail to prevent the formation of posterior synechiæ, an iridectomy may eventually have to be performed.

C. PURULENT KERATITIS.

This form of inflammation constitutes a well-characterized grouping, varying from localized infiltration to the most severe processes; but as they are all governed by similar principles, they may be all considered together.

The following varieties of the disease may be distinguished: (1) Hypopyon keratitis (ulcus corneæ serpens, Michel). (2) Circumscribed purulent infiltration of the cornea. (3) Keratomalacia (Schmidt-Rimpler), a purulent infiltration of the cornea which, in a few days' time, leads to a melting away of the membrane. (This condition has been especially observed after infection in cataract extraction, from diphtheria of the conjunctiva, and in general septic processes, as in typhoid and scarlet fevers.) (4) Ker

atitis xerotica,[1] also acute xerosis, which occurs in cases of infantile interstitial encephalitis. The disease affects chiefly badly nourished children in the first months of life, and usually terminates fatally. Not all authors, however, class it among the suppurative inflammations of the cornea. (5) Neuroparalytic keratitis (Schweigger), which is seen in paralysis of the trigeminus nerve.

Treatment.—As in all of these forms of corneal disease, the bacilli staphylococci and diplococci play the chief rôles, the principal treatment is naturally an antibacteric or an antiseptic one. Then follow such remedies as tend to produce a reconstruction and clearing of the opaque membrane. It is of the greatest importance to endeavor to prevent the spreading of the infection, especially toward the pupil and perforation into the anterior chamber, with extension to the iris and the uveal tract.

In each case, a careful investigation into the cause of the condition should be made. The conjunctival and the lacrimal sacs, as well as the tarsal conjunctiva of the everted upper lid, should be studied. The general nutrition should be improved by means of appropriate remedies. Treatment should, therefore, be begun with a thorough cleansing of the conjunctiva, especially at the inner canthus. For this purpose, corrosive sublimate solutions, one to three

[1] Schmidt-Rimpler, in his "Augenheilkunde," 1889, places xerotic keratitis under the head of purulent disease of the cornea. Fuchs, in his text-book, 1889, devotes a special chapter to the condition under the caption of Diseases of the Conjunctiva.

thousand and one to two thousand strengths, and oxycyanide of mercury solution, in one to one thousand and one to two thousand strengths, should be used (*vide* Chap. III).

If conjunctivitis is marked, some authors prefer to paint the conjunctiva with astringents, especially with a two per cent. strength solution of nitrate of silver (formula 16), while others prefer to use the corrosive sublimate vaseline-ointment previously noted.

If secretion is excessive, frequent washing of the conjunctival sac is necessary. In uncomplicated cases of corneal ulcer, treatment consists in the use of iodoform.[1]

191. ℞. Iodoformi, ... 5|0 gm. (ʒi¼).

This remedy is capable of producing a cure of even severe infectious processes and of large hypopyon-formations in a few days' time.

Instead of the powder, an iodoform ointment such as—

192. ℞. Iodoformi, ... 0|1 gm. (gr. iss)
Petrolati, ... 3|0 gm. (gr. xlv).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. Use as directed.

may be used. In a few cases, iodoform powder is not well borne. A little cocaine in two per cent. strength solution is of service in such cases of irrita

[1] In France, aristol is frequently employed because it does not irritate the eye and does not increase secretion (Vignes, Bourgeois). Valude uses a dry iodoform occlusive dressing.

tion. If employed, the eye is to be closed with a moist antiseptic dressing. Iodoform is contraindicated in hypersecretion of the conjunctiva. Königstein condemns the employment of the bandage in such cases. Michel adheres to a middle course, advising that, according to the amount of secretion, the bandage be worn for from six to twelve hours' time.

As already indicated, the bandage should consist of moist borated lint, gauze and cotton, gutta-percha paper, or cambric. It is to be worn until the cicatrix is sufficiently firm on the floor of the ulcer, or until it is "shining" (Michel), after which the use of corrosive sublimate vaseline-ointment, night and morning, is sufficient.

Treatment of Complications.—In superficial ulcers, atropine is not always necessary; but when the ulcers are complicated with signs of irritation on the part of the iris, the drug is indispensable. Some employ a one per cent. strength solution twice daily. Others use a half per cent. strength solution four to six times a day.

Atropine is, of course, indicated as soon as the iris participates in the process or when pus appears in the anterior chamber (hypopyon). The attempt to combat the process by such mild measures as warm boracic acid solutions or chamomile tea compresses, accompanied by the hourly dusting of iodoform, with the application of a bandage, is always justifiable. In a few cases, this method is successful, but if the ulcer enlarges and the hypopyon increases, then there is danger of perforation of

the ulcer into the anterior chamber, with prolapse of the iris and the formation of anterior synechiæ.

In small ulcers, the best treatment is touching them with the galvano-caustic loop or with the incandescent point of a sound. This procedure is also valuable in large ulcers, but Saemisch's method, which consists in the scarifying of the base of the ulcer with von Graefe's cataract-knife, has met with equal favor.

The cauterization can usually not be completed in one sitting, but has to be repeated several times. It is important to well cauterize the margin of the ulcerous area. If the ulcer is large and deep, its central portions may also be touched with the cautery, in order, if possible, to produce a perforation, because, if this is done, suppuration immediately ceases. In doing this, caution is necessary, as the contents of the mass with the aqueous humor are often forcibly ejected. A blepharostat is not always necessary, as the eye can be rendered almost insensible by the employment of cocaine.

If a galvano-cautery is not at hand, the puncture may be made with a Desmarres' paracentesis needle, a bistoury, or a heated sound.

After-treatment consists in cleaning the conjunctival sac with corrosive sublimate solutions, followed by the application of moist dressings that should be renewed in from eight to ten hours' time each.

Before the bandage is applied, or, better, before the operations noted are performed, the following rules should be observed. Pressure is to be avoided

during the examination of the eye, and the position of the ulcer should be accurately noted, as it governs, to a certain extent, the subsequent treatment. If it is situated centrally, atropine is indicated in order to remove the iris from the point of perforation. If it is located peripherally, atropine, for the same reason, is contraindicated. In the latter case, some use eserine, while others employ pilocarpine. Physostigmine probably deserves the preference.

193. ℞. Physostigminæ salicylatis, . . 0|025 gm. (gr. $\frac{1}{5\,0}$)
Hydrargyri chloridi corrosivi, 0|001 gm. (gr. $\frac{1}{1\,0\,0}$)
Sodii chloridi, ... 0|005 gm. (gr. $\frac{7}{1\,0}$)
Aquæ destillatæ, ... 5|0 c.c. (f℥ i$\frac{1}{4}$).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

194. ℞. Pilocarpinæ hydrochloratis, . . 0|2 gm. (gr. iij)
Sodii chloridi, ... 0|01 gm. (gr. $\frac{3}{2\,0}$)
Hydrargyri chloridi corrosivi, . 0|002 gm. (gr. $\frac{3}{1\,0\,0}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥ iiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison. (Schmidt-Rimpler.)

195. ℞. Physostigminæ sulphatis neutralis, ... 0|025 gm. (gr. $\frac{1}{5\,0}$)
Aquæ destillatæ, ... 2|5–5|0 c.c. (♏xxxviij–f℥ i$\frac{1}{4}$).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

196. ℞. Physostigminæ salicylatis, . . 0|02 gm. (gr. $\frac{3}{1\,0}$)
Aquæ destillatæ, ... 3|0 c.c. (♏xlvj)
Liquoris hydrargyri chloridi corrosivi (1 : 5000), . . . 5|0 c.c. (f℥ i$\frac{1}{4}$).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

197. ℞. Physostigminæ sulphatis neutralis, ... 0|05 gm. (gr. $\frac{7}{1\,0}$)
Aquæ destillatæ, ... q. s.
Lanolin, ... 5|0 gm. (℥ i$\frac{1}{4}$).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. (Hirschberg.)

After perforation of an ulcer has taken place, the treatment remains the same, any prolapse of the iris, if not too large, being left undisturbed. If, however, the prolapse becomes distended from intra-ocular pressure, a small puncture may, if there be no fear of infection, be made at the base; or the prolapse may be excised. The after-treatment demands a carefully applied occlusive dressing.

If a large portion of the cornea has been lost, it may be advisable to remove the lens.

At times, the ulcer shows a tendency to perforate. Under these circumstances, especially should the ulcerous area exhibit signs of increasing, it is preferable to evacuate the hypopyon with a lance-shaped knife.

The treatment of the associated phenomena is to be conducted *pari passu* with that of the ulcer. Disease of the lacrimal sac should be removed by operative procedures. Chlorine-water and iodoform are valuable adjuvants. After suppuration has ceased and only a mucoid secretion remains, resort may be had to tonics and astringents. Slitting of the lacrimal sac is important. In France,[1] solutions of boracic acid and aristol are in use. At the 1892 session of the French Congress of Ophthalmology, Bourgeois[2] (Rheims) spoke of the treatment of severe cases of hypopyon-keratitis complicated by dacryocystitis. He proceeds as follows: If the purulent infiltration of the cornea is so far advanced that

[1] "Centralblatt für praktische Augenheilkunde," 1892, S. 406. [2] *Ibidem.*

two-thirds of the membrane are involved, he first disinfects the lacrimal passages with corrosive sublimate solution of one to one thousand strength, and instils solutions of one to twenty strength of chloride of zinc into them. This done, he syringes the conjunctival sac and nasal mucous membranes with a solution of boracic acid. The hypopyon is then evacuated and the anterior chamber is drained with a "fil de Florence" and irrigated with a solution of boracic acid or borax. An antiseptic occlusive dressing is then applied and changed every twelve hours in order to instil eserine and to apply aristol. The bandage is kept moist with corrosive sublimate solutions of one to one thousand strength.

Fuchs[1] speaks as follows concerning the treatment of corneal ulcers: If the case comes under treatment at the proper time, prognosis is usually favorable. Recent (progressive) ulcers that are not clean must be treated with reference to the cause (the cilia, the conjunctiva, and lacrimal sac should be investigated), followed by the employment of atropine and a bandage. In suppurative conditions, warm moist compresses, iodoform, the thermo-cautery, and paracentesis corneæ are the chief measures.

At the commencement of the treatment, attention should be given to the question of the prognosis. If there is a probability of impairment of vision, the physician should inform the patient in order that he may not afterward be held responsible.

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[1] "Lehrbuch der Augenheilkunde," 1889, S. 162.

Schmidt-Rimpler wisely advises that during convalescence a pressure-bandage should be worn for a long period of time, since even with a smooth corneal scar, staphyloma may occur later. He also recommends, regardless of the position of the ulcer, the use of eserine in order to protect the lens and the vitreous humor against infection from the fluids and material in the anterior chamber. It also often happens that, through a forward movement of the lens after perforation and its too close apposition to the infected cornea, there may be a resultant opacification of the anterior capsule.

(Concerning treatment with corrosive sublimate injections, see Chap. III.) The different forms of suppurative keratitis demand a few changes in ordinary routine methods of treatment.

In the circumscribed forms of purulent infiltration of the cornea, there is a special tendency to iritis. If perforation of a peripheral ulcer is threatened, eserine or pilocarpine is contraindicated because it increases iridic disturbance. Under such circumstances, leeches, ointments to the forehead and temple, and narcotics should be ordered.

In abscesses of the cornea, iodoform is not well borne. It seems to act best in those cases in which superficial epithelial abrasions lead to ulceration and the formation of hypopyon. In such cases, the abscess should be opened and chlorine-water should be instilled. Fukala[1] recommends ablation of the

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[1] "Berliner klinische Wochenschrift," 1892, Nr. 49.

superficial corneal layers covering the abscess. This is to be done, under cocaine anesthesia, with an iris-scissors. The procedure is to be followed by the employment of corrosive sublimate solutions of one to five thousand strength, with atropine, and bandages.

In keratomalacia, moist, warm, antiseptic dressings, with instillation of chlorine-water and atropine, are especially indicated.

Xerotic keratitis is treated in a similar manner. Some authors recommend the steam-spray. Prognosis is unfavorable. Neuroparalytic keratitis practically demands a similar form of treatment. Cases are recorded[1] which have been treated with bandages and hot poultices, the constant current, strychnine, iodine, and the mercury preparation. Du Bois-Reymond[2] mentions temporary suturing of the lids instead of the employment of a protective dressing.

In all of these cases, the general health is to be improved with roborants, etc., and cleanliness is to be fostered by baths. These recommendations need special mention.

D. CORNEAL ULCERS.

Text-books on ophthalmology in the north and south of Germany differ in an important point.

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[1] "Medical Record," July 26, 1890, Wheelock, "Trophoneurotic Keratitis."

[2] "Lehrbuch der Augenheilkunde," 1895.

While in Northern Germany, ulcers and purulent inflammations of the cornea are described in special chapters (Schweigger, Schmidt-Rimpler), it is customary among writers in the south of Germany to treat of them in association (Michel, Königstein). Fuchs describes keratitis suppurativa and keratitis non-suppurativa under separate headings.

Undeniably, the method of classification adopted in South Germany is simple and the more practical, since in the other plan, repetitions cannot be avoided. The principles of treatment, moreover, are the same. The pathological conditions are, however, in part so unlike, that it is, nevertheless, desirable to retain the distinction between the two forms.

We have here to deal with corneal ulceration without suppurative infection after trauma; after catarrhal, blennorrheal, herpetic, and trachomatous affections of the conjunctiva; and after phlyctenular and fascicular keratitis, distichiasis, and meibomitis.

According to the character of the ulcer, the following varieties of inflammation can be distinguished: Resorption and healing ulcers, rodent and annular ulcers, and dendritic keratitis.

In the resorption and healing ulcers, which, as a rule, are accompanied by but slight irritation, and which are transiently colored green by fluorescin, tepid compresses and atropine are indicated. The following formula can also be recommended:

198. ℞. Tincturæ opii, ... 10 c.c. (♏xv)
Aquæ destillatæ, ... 50 c.c. (ƒʒi¼).
Misce et fiat collyrium.
SIGNA.—Eye-drops.

Fröhlich[1] states that resorcin in ten to twenty per cent. strengths gives the ulcerous area a reddish appearance.

In rodent ulcer, early galvano-cauterization, followed by moist antiseptic dressings, should be used. At times, scarification of the vessels of the corneal margin is of value. (Concerning galvano-cautery treatment, see the preceding chapter.)

In Russia,[2] fifty per cent. solutions of lactic acid are applied to the ulcers, especially to those of septic origin. This plan of treatment, however, does not seem to possess any advantages over the method by the galvano-cautery.

In annular ulcers of the cornea, the treatment is on the whole the same, except that paracentesis of the anterior chamber is thought to be more successful in its results than the galvano-cautery.

Goldzieher recommends his ointment of sodium sozoiodolicum in all ulcers of not too large an area, and not too deep an extent (see formula 190). He cautions against the too liberal employment of cocaine, believing that this drug is apt to produce a certain degree of xerosis of the cornea.

The acute dendritic form of keratitis is characterized by deep furrows with grayish edges. It is usually accompanied by severe irritation, as lacrimation and photophobia. There is, however, a chronic variety,—a chronic peripheral dendritic keratitis

[1] "Centralblatt für praktische Augenheilkunde," 1892, S. 433.

[2] *Ibidem*, 1894, p. 463. ("Sour Milk in the Treatment of Corneal Ulcers," by Dolschenkow.)

(Schmidt-Rimpler),—in which the phenomena of irritation are absent. In such cases, irrigation with the corrosive sublimate solutions and the use of eserine are advised.

In general, the following points should be observed in all cases:

1. If there is marked conjunctival secretion, cold compresses, together with the painting of tannin solutions on the conjunctival surface, are indicated.

2. If the condition is not complicated with blennorrhea of the conjunctiva, the compresses should be warm, and either iodoform or the following wash should be applied:

199. ℞. Creolin, ... 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 5|0 c.c. (f℥i¼).
Misce et fiat collyrium.
SIGNA.—Eye-drops.

In France,[1] de Wecker has cautioned against the too frequent use of eye-drops. He advises that corneal ulcers be treated with careful disinfection of the lids, and scraping of the ulcers, this to be followed by subconjunctival injections of a few drops of one to two thousand strengths of corrosive sublimate solution and firm bandaging.

3. All cases demand the use of atropine when the iris is involved.

4. When severe irritation (lacrimation and pain) is present, Arlt's ointment (*vide* formulæ 176 and 177) for sleep and iodine as a counterirritant, may

[1] "Centralblatt für praktische Augenheilkunde," 1894, S. 470.

be ordered. Calomel and yellow oxide of mercury ointment are contraindicated.

5. If perforation is threatened, it should be anticipated by puncture, which will also stimulate the reparative process of the cornea through the action of the aqueous humor. The puncture should be made through the bottom of the ulcerous mass. (It is to be remembered what has been said in the preceding chapter concerning the use of eserine and atropine.)

The observation of Schmidt-Rimpler that, in evacuation of the anterior chamber, the pupil itself becomes contracted, must also be recalled. The after-treatment demands employment of a pressure-bandage.

6. If prolapse of the iris exists, the treatment should be established as previously indicated.

Abroad [1] (in countries outside of Germany), corneal ulcers are treated in the same manner as corneal suppuration. In France, Warlomont and Valude proceed as follows: The conjunctiva is cleansed with corrosive sublimate solutions of one to two thousand strength, followed by the dusting of iodoform upon the ulcer. Bandages of iodoform gauze and cotton are to be applied. This form of treatment acts particularly well in the scrofulous and the trachomatous forms of ulceration. The plan is contraindicated in suppuration of the lacrimal sac and in purulent catarrh.

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[1] "Centralblatt für praktische Augenheilkunde," 1892, S. 554.

De Wecker[1] treats ulcers and abscesses of the cornea by means of the curette and then proceeds in the same manner as that which is pursued by Fukala. He also uses sprays of four per cent. strength boracic acid solutions.

Noyes (New York)[2] recommends a single application of liquefied pure phenol upon a platinum wire.

In Russia,[3] the treatment of corneal ulcers is accomplished by means of lactic acid, fifty per cent. strengths of solution being applied with pointed rods.

In the treatment of scrofulous corneal ulcers, Thomalla[4] recommends iodol. It is used in a finely powdered form. It has the advantage that iodine preparations may be administered internally at the same time, which is not the case when calomel is used.

Since 1890, a special form of corneal inflammation has been described. It is known as "Fädchenkeratitis" (Uhthoff, Leber, Fischer, Czermak, and others). It is characterized by the presence of glassy mucous threads on the conjunctiva, which are similar to asthma-spirals and contain numerous leucocytes. They are produced in a mechanical manner.[5] Therapeutically, this variety of inflammation has no special importance.

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 559.

[2] *Ibidem*, 1894, p. 277.

[3] "Deutsche Medizinal-Zeitung," 31. Jan., 1895, S. 108 (Dolschenkow).

[4] "Centralblatt für praktische Augenheilkunde," October, 1891.

[5] "Wiener klinische Wochenschrift," 1891, Nr. 20.

E. OPACITIES OF THE CORNEA.

In mild cases, these opacities are slight (nebulæ, maculæ). In severe ones, they consist of whitish cicatrices (leucomata). The latter are not amenable to medicinal treatment. The prognosis is the better the younger the subject.

Medicinal treatment of maculæ is, after the condition has once become stationary, of slight value. A great number of remedies have been recommended, among others hot salt-steam applied to the eye from an inhalation apparatus through a long, narrow funnel. The constant current, electrolysis, turpentine, tincture of opium, and the following formulæ, have all been employed :

200. ℞. Potassii iodidi, ... 0|3 gm. (gr. iv)
Sodii bicarbonatis, ... 0|2 gm (gr. iij)
Petrolati, ... 3|0 gm. (gr. xlvj).
Misce et fiat unguentum.
SIGNA.—Eye-salve.

201. ℞. Potassii iodidi, ... 0|15 gm. (gr. ij)
Sodii bicarbonatis, ... 0|25 gm. (gr. iii$\frac{4}{5}$)
Aquæ destillatæ, ... 15|0 c.c. (f℥iij, ℿlj).
Misce et fiat collyrium.
SIGNA.—Eye-drops.

202. ℞. Olei terebinthinæ,
Olei amygdalæ, ... āā 10|0 c.c. (℥iiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops. (Königstein.)

Excessive irritation should be avoided.[1]

Recently, in the eye clinic of Schiess, in Basle,

[1] "Centralblatt für praktische Augenheilkunde," 1895, S. 92.

subconjunctival injections of salt have again been brought into use against destructive corneal processes and parenchymatous keratitis. They do not seem to irritate, and have been found preferable to the corrosive sublimate injections, besides exerting a favorable influence upon the opacities. Their mode of action consists in an acceleration of the lymph-stream circulation. The following solution was employed :

203. ℞. Sodii chloridi, ... 1.0 gm. (gr. xv)
Aquæ destillatæ, . . . 10.0–30.0 c.c. (f℥ iiss ad f℥ viiss).
Misce et fiat solutio.
SIGNA.—Drops for injection.

According to Michel, calomel, yellow oxide of mercury ointment, and massage deserve the most confidence. Where a change of remedies is indicated, iodide of potassium ointment may be substituted.

Schmidt-Rimpler[1] has seen good results follow the employment of the constant current. He places a knob-pointed zinc pole of a small battery (four elements) directly upon the corneal opacity, and holds the copper pole in close proximity, rubbing the opaque portion of the membrane for from ten to twenty seconds at a time. This treatment is repeated at intervals of from one to two weeks.

At times, calcareous concretions are found in old scars. These can be removed with a cataract-needle or with a sharp spoon. In the treatment of

[1] "Handbuch für Augenheilkunde," 1889, S. 489.

these calcareous deposits, Birnbacher[1] recommends that the cornea be touched with a five per cent. strength solution of hydrochloric acid, which is immediately neutralized with a five per cent. strength solution of carbonate of sodium.

More recently, Tomamscheff[2] recommends scarification of the leucomata, followed by the employment of sulphate of copper or yellow oxide of mercury ointment.

In Italy, Simi ("Bollettino d'oculistica," 1892, No. 4) recommends the daily use of concentrated citric acid as an application to nebulæ and leucomata, claiming that it causes their disappearance in about nine months' time.

The operative procedures are as follows: (1) Tattooing of the maculæ and the leucomata, as introduced by de Wecker during the years 1870 to 1880. (2) Optical measures. These consist in attempting to improve vision by means of stenopaic glasses and concave lenses. In a certain sense, the tattooing also improves vision, as has been observed by Meyer.[3] (3) Operative treatment. In this category, iridectomy, which in a certain percentage of cases may be combined with tattooing, holds the first rank. Keratoplasty (von Hippel) occupies the next place. Michel reports the successful transplantation of a rabbit's cornea by means of a von

[1] "Centralblatt für praktische Augenheilkunde," 1. September, 1893.

[2] "Deutsche Medizinal-Zeitung," 31. Januar, 1895, S. 108.

[3] Meyer, "Handbuch für Augenheilkunde," Uebersetzt von Block, 1875, S. 106.

Hippel's trephine, achieving an improvement of vision from the ability to see to count fingers to one-tenth and one-twentieth of normal.

Among the newest medicinal agents suggested in the treatment of the various forms of corneal inflammation, the following should be named: Antipyonin,[1] which, in a hyperborated sodium compound, is recommended in corneal and conjunctival inflammations. It appears to be identical with tetraborate of sodium, which is successfully used in ear troubles. It is dusted on the eye in phlyctenulæ of the cornea and the conjunctiva, in pannus, in corneal ulcers, and in all forms of conjunctivitis in which calomel is used.

Salicylate of cadmium[2] is recommended in purulent forms of keratitis and conjunctivitis that are accompanied by excessive secretion:

204. ℞. Cadmii salicylatis, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat collyrium.
SIGNA.—Eye-wash.

Formaldehyd:[3] This drug diminishes secretion in purulent, in blennorrheic, and in catarrhal conjunctivitis. It likewise exerts a favorable influence upon corneal ulcers. It is employed in solutions of one to two thousand strength every two hours.

205. ℞. Formaldehyd, ... 10|0 c.c. (f℥iiss).
SIGNA.—Twenty drops in one liter (one quart) of water. Eye-wash.

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[1] Merck, "Bericht über das Jahr 1894," S. 39, and Rolland, "La Semaine Mèdicale," 1894, p. 234.

[2] P. Cesaris, "Bollettino chimico-farmaceutico," 1894, p. 417.

[3] Gepner, "Centralblatt für praktische Augenheilkunde," 1894, S. 161.

F. INJURIES TO THE CORNEA.

What is true of injuries in other parts of the body, is also true of the cornea—namely, small wounds are often more dangerous and harmful than larger ones. For example, not every practising physician thinks of determining the prognosis of a slight abrasion of the corneal epithelium received by a workman during harvesting by making pressure over the lacrimal sac and ascertaining the presence of muco-pus—a condition that may prove dangerous to the entrance of germs into the eye through an open corneal wound. In fact, usually atropine and warm mild chamomile compresses are prescribed, which merely favor the colonization and the development of pure cultures of bacteria.

If such cases were at once treated antiseptically, hypopyon-keratitis would be as rare as panaris is in the barracks, where even the slightest injury to the fingers of the soldiers is energetically treated with five per cent. strengths of phenol solution.

The treatment of fresh corneal wounds produced by needles, knives, scissors, wire, spears of grain, caterpillar hairs, and other foreign bodies should begin with an examination and treatment of the lacrimal passages, after which attention may be bestowed upon the conjunctiva and the cornea.

If no complications are present, ordinary antiseptic measures, such as irrigation of the conjunctival sac with one to five thousand strengths corrosive sublimate solution, cleansing of the con-

junctival fold with cotton moistened with corrosive sublimate solution, dusting with iodoform, and the application of bandages, suffice. Atropine should not be used.

If the lacrimal passages are found to be diseased, and a mucoid or a purulent secretion can be expressed from the lacrimal ducts, it is necessary at once to split the canaliculi, and, after a thorough disinfection of the lacrimal sac, to touch the corneal wound with a galvano-cautery.

In cases of irritation of the iris, the use of atropine is not only necessary, but it should be continued until it produces the best possible mydriasis. During the first few days of the injury, dilatation may be secured by repeated atropinization. Later, it may be impossible to obtain this condition, pupillary contraction, unfortunately, being particularly serious where, in elderly persons, in addition to posterior synechiæ, traumatic cataract exists. This is a point which is not frequently enough considered by practitioners, the omission of which, at times, may prove detrimental to the welfare of the eye. It is, therefore, important to watch the patient for at least one-half to one hour after the use of the drug, until it is certain that the greatest action of the atropine as is possible has been secured. Foreign bodies in the cornea (iron, stone, and bits of coal, etc.) demand the employment of cocaine, irrigation with corrosive sublimate solutions, and the removal of the offending material with a cataract-needle, a Daviel's spoon, or a spud. This done,

iodoform is to be dusted or anointed on the surface and a bandage is to be applied. Bodies that have penetrated deeply, demand surgical interference. The scales of certain seeds often remain a long time on the cornea, producing inflammatory reaction. They are readily removed while the eye is placed under the anesthetic influence of cocaine.

Particles of gun-powder that have entered the cornea do not, as a rule, have to be removed. Most painful are superficial epithelial losses produced by the finger-nail, the hairs of caterpillars, straws, thorns, etc. Repeated cocaine instillations, moist corrosive sublimate or boracic acid compresses, combined with cold applications, meet the indications.

In large wounds of the cornea that are complicated with injury of the iris, lens, or sclera, the first treatment is, of course, of great importance. It consists of irrigation with corrosive sublimate solutions in the proportion of one to two thousand strength or oxycyanide of mercury one to two thousand strength, which is less irritating than the former, combined with the use of cocaine. In very recent cases, a prolapsed iris should be replaced with a Daviel's spoon, or, if this procedure should prove unsuccessful, the protruding portion should be excised. Atropine and iodoform are to be used, and a pressure-bandage should be applied. Above all things, it should be remembered that in recent cases, the everted conjunctiva is to be cleansed with corrosive sublimate solutions upon cotton swabs. The lacrimal sac is to be examined, and iodoform

must be dusted into the eye before a bandage is applied. All atropine and cocaine solutions should be freshly prepared, either with corrosive sublimate water, one to five thousand strength, or with freshly boiled water. The complication of traumatic cataract demands operative interference. If pain is severe, ice compresses should be placed over the bandage.

At times, even slight superficial injuries of the cornea leave symptoms of irritation, lacrimation, pain, photophobia, and swelling of the lids—*recurring* or *cicatricial keratitis* (Schweigger). Treatment consists in the use of atropine and the employment of moist warm pressure-bandages, followed by calomel. These cases of keratitis are manifestly of an infectious character.

Chemic agents as causes of corneal injuries demand special treatment. Injuries of this kind are produced by burning and corrosion—as, for example, with mineral acids and other chemicals, unslaked lime, molten iron or glass, flying particles of iron and glass, and exploding powder.

Prognosis, as compared with that of conjunctival injuries, is more favorable so long as the pupillary region of the iris-membrane remains undisturbed. The author has seen severe injuries in laborers employed in glass factories, produced by heated glass and accompanied by perforation of the cornea with prolapse of the iris, recover in three weeks' time, with vision of two-thirds of normal ($\frac{6}{9}$), this result being obtained despite the fact that the

prolapses were situated at the sclero-corneal junction. These particular injuries seem to give a better prognosis because the wounds are sterile from the beginning.

Treatment demands the use of cocaine, cold compresses, with rest in bed. In recent cases, in which, for example, an injury has been produced by lime, the eye is to be thoroughly cleansed and irrigated with neutralizing agents, such as weak acidulated water (in the case of lye, with milk) followed by washing of the exposed surfaces with oil. In the case of lime-burns, concentrated solutions of sugar should be advised. The after-treatment consists in the employment of atropine and cocaine, with the use of moist and cold compresses. A final indication is the prevention of symblepharon. This is accomplished by means of frequent eversions of the lids, instillations of almond-oil, and the insertion of egg-skin or gold-beater's skin (Königstein). In deep injuries, however, these methods prove ineffectual.

At times, the patient may complain that there is "something" remaining in the eye. If no foreign body can be found, several drops of a two per cent. strength cocaine solution is to be instilled and a moist dressing should be applied. In all cases of penetrating wounds of the eye, especially if they are situated at the sclero-corneal junction, it is very important, if there is any suspicion of sympathetic trouble, to also test the central vision and the visual field of the healthy eye, for a time, at least, in order to early recognize the possibility of development of sympathetic affection.

Silex[1] gives the following valuable suggestions for the treatment of recent penetrating injuries of the cornea and the sclera: The examination should be made while the patient is in a recumbent posture, and even general anesthesia may be necessary in order to prevent any straining on the part of the patient, cocaine not being sufficient in such cases.[2] This done, the eye should be cleansed with some corrosive sublimate solution of one to five thousand strength, and any prolapsed portion of the iris-tissue and vitreous humor removed with a scissors or a scalpel and a forceps. The lacerated conjunctiva should be smoothed and carefully sutured—that is, provided that no foreign body remains *in situ*. If one be present, careful examination and removal with the forceps is the best treatment; or if the foreign body be of iron or steel, it will be necessary to employ an electro-magnet for its removal. The best form of electro-magnet is that which has been devised by Hirschberg. The electrode should be either carried through the original wound itself, or an incision corresponding to the position of the iron particles, should be made by the surgeon. Extensive search throughout the vitreous body should be avoided.

All suturing material, which should be made of cat-gut, should be preserved in four per cent.

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1 "Berliner klinische Wochenschrift," "Ueber perforirende Wunden," 1888, Nr. 20, S. 396.

2 The ordinary condition of the vitreous humor and the extravasated blood at the time, in such cases, also render an adequate examination difficult.

strength phenol solutions. The sutures should not be made so as to pass through the sclera, as they are apt to wrinkle this membrane, but should be carried only in to the conjunctiva. After this is done, iodoform should be dusted on the surface and a pressure-bandage, which is to be changed twice a day, is to be applied. The eye should not be disturbed for a few days' time.

CHAPTER X.

TREATMENT OF DISEASES OF THE SCLERA.

1. EPISCLERITIS.

The site of this affection (also scleritis) is usually in the superficial layers or between the sclera and the conjunctiva. At times, circumscribed swellings that bear a close resemblance to phlyctenulæ, make their appearance.

In simple cases of scleritis, while the prognosis is good despite the long duration of the disease and repeated exacerbations (scleritis migrans), the termination is less favorable in cases that are complicated with keratitis or iritis, since synechiæ, opacities of the vitreous, and increased intraocular tension are apt to ensue. The most frequent causes of the condition are rheumatism, cold, gout, tuberculosis, and syphilis. Treatment is primarily causal. In cases

of cold or rheumatism, salicylate of sodium, with the addition of warm salt or thermal baths, is to be prescribed. In syphilitic cases, iodide of potassium should be ordered. General treatment, which is practically symptomatic, consists in rest to the eye by the patient remaining in a darkened room, or by the employment of goggles. Particularly is this so when irritation is present. Locally, atropine is to be instilled and moist warm compresses should be applied three times daily for half an hour at a time. As a derivative measure, some ophthalmologists paint the temple of the affected side with tincture of iodine, while others apply Arlt's ointment. In cases in which severe iritis is present, the local application of leeches and the internal use of morphine should be made.

In recent cases, Schweigger recommends cold compresses and laxatives. In the latter stages, after the irritative phenomena have subsided, the use of calomel and one per cent. strengths of yellow oxide of mercury ointment should begin. Michel considers massage of great value. In cases of more marked infiltration, Schmidt-Rimpler combines massage with the use of cocaine and scarification.

Mansfield[1] prescribes massage with yellow oxide of mercury ointment twice daily. If the disease is protracted, scarification of the vessels (phlebotomy) may be performed. The main superficial branches of the scleral veins in the neighborhood of the

[1] "Centralblatt für praktische Augenheilkunde," 1892, S. 538.

inflammatory area may be divided under cocaine anesthesia, by the aid of a tenaculum, after they have been lifted free from the surmounting tissue. This procedure may be repeated several times.

If the iris participates in the morbid process, full and repeated atropinization becomes necessary. If opacities of the vitreous humor form, the sweat-cure, hot baths, or mercurials in the form of gray ointment or corrosive sublimate injections are indicated. As early as 1870, successes with the inunction-treatment were reported.[1] In more recent literature, the following remedies have been recommended: The constant current,[2] one to one and a half milliamperes every second day for one minute at a time, may be of use. In its application, one electrode is to be placed on the sclera while the other should be applied to the cheek. Goldzieher uses the following ointment:

206. ℞. Sodii sozoiodolici,[3] . . . . . 0|25 gm. (gr. iii¼)
Petrolati, ... 10|0 gm. (℥ iiss).
Misce et fiat unguentum.
SIGNA.—Eye-ointment.

Wicherkiewicz[4] recommends instillations of antipyrine in five to ten per cent. strength solutions. Schreiber[5] speaks favorably of Irish-Roman baths.

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[1] Graefe und Saemisch, "Handbuch der gesammten Augenheilkunde," Band IX, S. 326.

[2] "Tageblatt der Versammlungen deutsche Naturforscher und Aerzte," Wien, Sept., 1894.

[3] German Pharmacopeia.

[4] "Centralblatt für praktische Augenheilkunde," 1. April, 1892; 1893, S. 544.

[5] *Ibidem*, 1. Nov., 1892.

(Concerning the value of subconjunctival injections, see Chap. III.) Injections of salicylate of soda are also worthy of a trial :[1]

207. ℞. Sodii salicylatis, ... 0|025 (gr. i $\frac{3}{10}$)
Cocainæ hydrochloratis, . . . 0|005 (gr. $\frac{7}{100}$).
Misce.
SIGNA.—To be used for injection purposes. (van Moll.)

2. WOUNDS OF THE SCLERA.

In wounds of the sclera, the following points should be noted : (1) As a rule, if there is a large tear produced,—for example, by some dull point, as the horn of a cow,—and if the internal ocular membranes are prolapsed and the ciliary body is injured, the globe, as a rule, should be enucleated. (2) In small wounds, either the sclera or, better still, the conjunctiva, should be sutured, and, just as in corneal and conjunctival wounds, antiseptic dressings must be applied. If the pains are severe, cold compresses and blood-letting are indicated. If panophthalmitis is threatened, moist warm compresses should be used. (Concerning compresses, see the previous chapter.) In order to guard against sympathetic disturbance, the visual field and the central acuity of

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[1] "Klinische Monatsblätter für Augenheilkunde," 1. Oct., 1892. The following formula there given may be of value :

℞. Sodii salicylatis, ... 0|375 gm. (gr. iii $\frac{7}{10}$)
Cocainæ hydrochloratis, ... 0|075 gm. (gr. i $\frac{3}{20}$)
Aquæ destillatæ, ... 5|0 c.c. (f℥ i¼).
Misce et fiat collyrium.
SIGNA.—Eye-drops. (Five to seven drops for injection purposes.)

vision of the healthy eye should be frequently observed, just as was noted in the section on penetrating injuries of the cornea.

CHAPTER XI.

TREATMENT OF DISEASES OF THE IRIS.

1. IRITIS.

Inflammation of the iris belongs to the most dangerous class of diseases of the eye. This is partly because of the results to the diseased eye itself, and partly on account of the various mistakes which the practitioner may make. Thus it happens that total posterior synechiæ are sometimes treated continuously with atropine, until the eye has become blind and secondary glaucoma has developed. Again, all signs of irritation may be absent, especially in childhood, and particularly in cases in which pericorneal injection is not present, thus permitting a chronic iritis to be overlooked and the condition diagnosed as a conjunctival affection ; and even, for example, treated with zinc solutions. Moreover, although the disease may be properly recognized and atropine employed, yet the effect of the drug is not controlled.

The consequence of all this is that numbers of cases—to which others are constantly being added—have an unfavorable termination, from the additional

fact that, being unaccompanied by pain, they are not regarded seriously by the patient, which could have been avoided had the condition been early recognized and properly treated.

It would be beyond the scope of this book to give a description of the different stages of iritis, from that of simple irritation to iridocyclitis. However, the points that are of value in practice may be stated in a very few words.

The causes of iritis are in part both primary and secondary. The principal primary ones are: traumatism, syphilis, rheumatism, scrofula, cold, and grave infectious diseases, such as typhoid fever, relapsing fever, malaria, cerebro-spinal meningitis, chronic nephritis (contracted kidney), diabetes mellitus, and arthritis. Iritis is termed secondary if an inflammation of the adjoining membranes has extended to the iris-tissue, as from the sclera, the cornea, the chorioid, and the ciliary body.

A knowledge of the causes is of value, because the prognosis and the treatment are governed by them. Iritis may also influence the neighboring parts, as the cornea, the ciliary body, the lens, the chorioid, and the vitreous humor, leading at times to a loss of vision. In these conditions authors, as a rule, speak of irido-chorioiditis if the tension of the globe be increased, and of irido-cyclitis if it is diminished.

The mildest form of the disease is the so-called iridic irritation (hyperemia), with discoloration of the membrane, photophobia, lacrimation, contracted

pupil, and a slight circumcorneal injection. Among the inflammatory forms there are simple iritis (iritis plastica) with a tendency to the formation of posterior synechiæ.

The principal symptoms are: loss of brilliancy of the iris-tissue, conjunctival hyperemia, circumcorneal redness, discoloration, irregularity of form and surface, pupillary contraction, pain, and disturbance of vision. Circumcorneal redness is only present in the acute condition. In chronic states, it, as well as pain, is absent; so that if no attention be bestowed upon the getting of the visual power and the condition of the pupil, or if the influence of atropine upon the iris is not studied, the inflammatory condition may remain unrecognized.

In serous iritis, turbidity of the aqueous humor, with punctiform deposits on the posterior surface of the cornea (keratitis punctata, descemetitis), are to be added to the symptoms just noted. In addition to the ordinary methods of diagnosis, it is advisable to employ two lenses instead of one (a condenser and a magnifier), for it is not only less difficult to recognize punctiform deposits by this form of oblique illumination, but it is also possible to see the sphincter of the membrane and any synechiæ that may be present more readily in an area that is illuminated by a strong, brilliant artificial light. In this form of iritis, opacities of the vitreous humor and chorioiditis are not rare.

As a rule, suppurative iritis is either a sequel of purulent chorioiditis or it is of traumatic origin,

which leads to the formation of abscesses in the tissues of the iris, with resultant hypopyon.

Gummous or syphilitic iritis may appear either as a simple or as a condylomatous form of inflammation that is often complicated with chorioido-retinitis and depositions into the vitreous humor.

Tuberculous iritis is interesting, and by some is said to be characterized by the fact that it may be the earliest expression of tuberculous infection without demonstrable existence of tuberculosis in any other part of the body. It presents itself in the form of isolated tubercular nodules (Michel).

The treatment of iritis divides itself into causal, general, and local. If the inflammation is specific in type, mercury is indicated; if it is rheumatic in form, salicylate of soda, two grams (gr. xxx) at night, taken, if possible, in hot tea, should be prescribed. In such cases, some authorities recommend an emetic, such as the following, during the beginning of the treatment:

℞. Antimonii et potassii tartratis, . 0.5 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 100.0 c.c. (f℥iij, f℥j, ♏xl).
Misce et fiat solutio.
Signa.—To be used as an emetic.

In the suppurative or purulent form of the disease, treatment by mercurial inunction, in order to check the extension of the disturbance to the deeper parts of the eye (the chorioid and the ciliary body), is also of value.

Fuchs has seen good results in gonorrheal iritis from the use of gaultheria in doses of fifteen drops

daily. The chief remedy in the local treatment is atropine, the dose and the strength of which depend on the nature of the case. Most authors employ one per cent. strengths of antiseptic solutions of the drug :

208. ℞. Atropinæ sulphatis, ... 0|05 gm. (gr. $\frac{7}{10}$)
Liquoris hydrargyri chloridi corrosivi (1–5000) . . . . 5|0 c.c. (f℥ i$\frac{1}{4}$).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

209. ℞. Atropinæ sulphatis, ... 0|025 gm. (gr. $\frac{1}{50}$)
Sodii chloridi, ... 0|005 gm. (gr. $\frac{7}{100}$)
Hydrargyri chloridi corrosivi, 0|001 gm. (gr. $\frac{1}{100}$)
Aquæ destillatæ, ... 5|0 c.c. (f℥ i$\frac{1}{4}$).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison. (Schmidt-Rimpler.)

If mydriasis be obtained, a few instillations daily will be sufficient to retain it. If it is not produced, the eye should be atropinized at intervals of from one to two hours until the utmost dilatation possible has been obtained (du Bois-Reymond).

In severe cases, Hirschberg advises to instil atropine every hour or two for the first forty-eight hours. Later, he says, it should be used two or three times a day. In extreme instances, it should be employed several times at night with scopolamine once daily. Especially are these rules applicable in cases of rheumatic and syphilitic iritis.

In the beginning, especially in severe cases, Schmidt-Rimpler instils atropine three or four times daily, three instillations to be made at each time. As soon as dilatation is produced, the frequency of the instillations should be diminished.

Michel also uses atropine in the form of an ointment, in one-quarter of one to one per cent. strengths. He considers six to eight drops of a half of one per cent. strength solution a maximal daily dose for an adult.

The symptoms of atropine intoxication, such as dryness of the throat, acceleration of the pulse, vertigo, scarlatiniform redness of the skin, should be looked for in some children. Should restlessness, quickened breathing, and rapid pulse exist (the first signs of atropine poisoning), strong coffee should be prescribed. Strong solutions of atropine for the removal of synechiæ are not to be recommended; nor is hyoscine to be used for children, as it readily produces symptoms of intoxication (see Chap. III). Homatropine may be employed when atropine cannot be borne. Concerning the use of atropine applied in substance (Fuchs[1]), see page 50.

210. ℞. Homatropinæ, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss)
(Liquoris hydrargyri chloridi corrosivi, 1 : 5000; 1 : 10,000).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

Or—

211. ℞. Scopolaminæ hydrobromatis, 0|01–0|005 gm. (gr. iss ad $\frac{1}{100}$)
Liquoris hydrargyri chloridi corrosivi (1 : 5000), ... 5|0 c.c.(f℥i¼).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

If pains are severe, some writers advise the application of leeches to the temple. Others consider

[1] "Lehrbuch der Augenheilkunde," 1889, S. 322.

this a useless torture to the patient. The alternate employment of cocaine and atropine is more valuable.

212. ℞. Cocainæ hydrochloratis, . . . 02 per cent.
Liquoris hydrargyri chloridi
corrosivi (1:1500) . . . . 10.0 per cent.
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

In scrofula and syphilis, von Graefe recommends the internal use of the following formulæ:

213. ℞. Hydrargyri iodidi rubri, . . . 0|25 gm. (gr. iii$\frac{2}{3}$)
Potassii iodidi, ... 2|5–4|0 gm. (gr. xxxviij–lj)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss)
Syrupi, ... 50|0 c.c. (f℥j, f℥v).
Misce.
SIGNA.—One teaspoonful several times daily.

214. ℞. Hydrargyri iodidi rubri, . . . 0|15 gm. (gr. ii$\frac{3}{10}$)
Potassii iodidi, ... 1|5 gm. (gr. xxiij)
Aquæ destillatæ, ... 30|0 c.c. (f℥vij, ♏xlij).
Misce.
SIGNA.—Five drops three times daily.

Warm chamomile compresses or moist, warm dressings should also be prescribed. Some authorities extol the use of dry heat, while others praise Arlt's ointment as a derivative (176–177) or employ the following formula:

215. ℞. Veratrini, ... 0|03 gm. (gr. $\frac{2}{3}$)
Petrolati, ... 4|0–6|0 gm. (gr. vj ad ix).
Misce et fiat unguentum.
SIGNA.—Ointment for forehead. (Coccius.)

Tincture of iodine may be used instead. As the pain usually becomes exaggerated at night-time, especially about two o'clock in the morning (at which time it is frequently unbearable), morphine,

chloral, or sulphonal employed internally may be used instead of atropine locally.

In severe cases, the patient should be kept in bed. It is well to place other less grave cases in darkened rooms. All patients should wear smoked glasses. Food should be simple and non-irritating. Mild aperients should be given. If pain is severe, the following powder may be given internally:

216. ℞. Morphinæ acetatis, ... 0.015 gm. (gr. $\frac{1}{5}$)
Quininæ sulphatis,[1] . . . . . 0.12 gm. (gr. i$\frac{3}{5}$)
Sacchari lactis, ... 0.6 gm. (gr. ix).
Misce et fiant pulvis no. xij.
SIGNA.—One or two in the evening, as required. (von Graefe.)

Subcutaneous injections of pilocarpine or salicylate of sodium given internally, in two-gram (gr. xxx) doses each in a cup of hot tea (Fuchs), are also very useful. In order to prevent relapses, atropine should be continued for several weeks' time.

If, on the other hand, there is a sudden increase of pain, the tension of the globe should rise and the visual field be lessened, the case should be closely studied, as secondary glaucoma may supervene, indicating the necessity for the performance of an iridectomy. Operative procedure is probable in the following cases: If there are numerous deposits on Descemet's membrane; if vision deteriorates; and if pressure increases. In such cases, puncture of the cornea with evacuation of the aqueous humor is necessary. Fuchs and Schmidt-Rimpler praise injections of pilocarpine. If there is

a large hypopyon, paracentesis becomes necessary. In cases of synechiæ, when irritation is absent, atropine may be alternately used with eserine :

217. ℞. Physostigminæ sulphatis, . . 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

Or—

217*a*. ℞. Physostigminæ sulphatis, . . 0|05 gm. (gr. $\frac{7}{10}$)
Aquæ destillatæ, ... q. s. ad solutionem,
Lanolin, ... 5|0 gm. (℥i$\frac{1}{4}$).
Misce et fiat unguentum.
SIGNA.—Eye-ointment. (Hirschberg.)

As to the use of atropine, especially in severe forms of iritis, Silex[1] acts as follows: In acute cases, he employs six to ten drops of the following formula two or three times daily :

218. ℞. Atropinæ sulphatis, ... 0|1 gm. (gr. iss)
Cocainæ hydrochloratis, . . . 0|2 gm. (gr. iij)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat collyrium.
SIGNA.—Eye-drops. Poison.

Even in cases of total posterior synechiæ he uses atropine in order to place the ciliary muscle at rest. He says, however, that if intraocular tension increases, the use of the drug must be suspended.

If the pupil becomes occluded or excluded, an iridectomy should be performed. According to the experience of Coccius, softening of the globe, however, often follows the operation.

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[1] "Therapeutische Monatshefte," Januar, 1894, "Atropin in der Augenheilkunde."

The severest cases are those in which there is a complete flat adhesion of the iris and anterior lens-capsule, complicated by disease of the ciliary body. However, in all cases of total posterior synechiæ, it should be remembered that, after an iridectomy has been performed, opacities of the lens-capsule, the lens, or the vitreous body may be found.

In addition to the principles here formulated, the literature contains the following additional ones in regard to the treatment of the disease: Concerning Darier's method of injections of corrosive sublimate (see Chap. III), the researches of Schmidt-Rimpler have shown that a more extensive trial is warranted, and would be well to be made in iritis before anything definite can be asserted. In Russia,[1] scopolamine in one to five hundred strength (one to one hundred strength produces toxic symptoms), in combination with cocaine is employed three or four times daily.

In cases of subsiding tuberculosis of the iris, Leber uses tuberculin injections in the strengths of 0.0005 to 0.005 (gr. $\frac{7}{1000}$ ad $\frac{7}{100}$).

Alt[2] reports concerning the croupous or the hemorrhagic form of iritis. Here an exudation of a grayish-yellow translucent mass, with hyphæma, is found in the anterior chamber. The condition is characterized by pains, edema of the lids, and chemosis. Treatment consists in irrigation of the

[1] "Klinische Monatsblätter für Augenheilkunde," Februar, 1893, Raehlmann.

[2] "American Journal of Ophthalmology," October, 1893.

anterior chamber with corrosive-sublimate solution. The exudate consists of coagulated fibrin with numerous colonies of cocci.

Regarding the varieties of iritis that arise during the course of chronic endometritis, de Wecker[1] (France) looks upon them as cases of auto-infection, without, however, giving any positive bacteriologic data in support of the proposition. In every case, he says, the primary disease must be treated.

Pansier[2] (d'Avignon) claims to have used the constant current for the purpose of breaking posterior synechiæ, both in the acute and the chronic forms of iritis, with success. At first, he employs a current of five milliamperes' strength, but thinks that later from two to three milliamperes' strength is sufficient. The application is performed by placing the negative pole on the closed lid and the positive one behind the ear, the current being allowed to flow for about one-half an hour's time. Atropine should be instilled before the *séance*.

2. WOUNDS OF THE IRIS.

Iris-wounds demand strict antiseptic treatment. The conjunctival sac is to be irrigated with corrosive sublimate solutions of one to five thousand strength. If the wound is situated centrally, atropine is to be instilled, but if it is peripherally located, eserine is

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[1] "Centralblatt für praktische Augenheilkunde," 1891, S. 508.

[2] *Ibidem*, 1894, p. 422.

to be employed. If no complication is present, iodoform and an antiseptic dressing may be used. When the accident occurs in children, it will be found that the capsule of the lens is generally injured, as the lesion has usually been produced with a knife-blade or one of the points of a pair of scissors.

In peripheral wounds situated close to the sclero-corneal junction, there is danger of cyclitis and sympathetic ophthalmia in the other eye.

If the iris is prolapsed and the injury is recent, an attempt should be made to replace the iris tissue in position. This is performed after the use of atropine, cocaine, and massage. It should be done by endeavoring to smooth out the iris into place by means of a cataract spoon. If reposition cannot be readily obtained, the prolapsed portion must be excised.

If the wound is not recent, it is better to treat the prolapse expectantly, postponing any iridectomy, which will be then indicated, until later. In cases of severe peripheral injury with participation of the sclera and the lens, in which vision has been lost, enucleation is the safest measure, in order to protect the other eye from sympathetic irido-cyclitis.

Iron particles in the iris should, if possible, be removed with an electro-magnet.

Injuries received by dull objects may produce contusion or breakage of the iris-tissue, and even a partial separation from its ciliary attachment (irido-dialysis), with extensive hemorrhagic extravasations into the anterior chamber. In such cases, pressure-bandages and cold should be recommended, and the

blood in the anterior chamber, may, if desired, be removed by paracentesis. This latter procedure, however, is generally unnecessary, as hemorrhages in such a position are readily absorbed.

There is yet another series of abnormalities of the iris which, however, need not be considered here, from a therapeutic standpoint. Among these are atrophy, hypertrophy, tumors, cysts, and departures of the membrane from its normal form and position. Where treatment is indicated, it is operative.[1]

3. MYDRIASIS AND MIOSIS.

A few words should be devoted to mydriasis (with paralysis of accommodation) and miosis (with spasm of accommodation), since they are frequently met with in practice and are easily misinterpreted. It has happened to the author that he has mistaken atropine-mydriasis for traumatic paralysis of accommodation. The patient having secretly used atropine instead of solutions of eserine and pilocarpine, which had been prescribed for him, the author was misled by a circumcorneal injection and a series of conjunctival symptoms to deem the case one of traumatic paralysis. In this case, Nieden succeeded in exposing the fraud by means of an occlusion bandage and a search of the patient's clothing, by which an atropine-vial was discovered.

According to Schmidt-Rimpler, the mydriasis that

[1] See article by Eversbusch in "Klinische Monatsblätter für Augenheilkunde," December, 1893.

follows diphtheria is more readily removed by injections of diphtheria antitoxic serum than by any other remedy.

Mydriasis is to be considered a paralytic phenomenon in poisoning by certain alkaloids, meat- and sausage-poisoning, snake-bites, and the ingestion of poisonous mushrooms. Likewise, in general diseases, such as trichinosis, uremia, epilepsy, eclampsia, cerebral edema, anemia, and hypnosis (Michel), the condition may be found.

Traumatic mydriasis is seen in contusions of the eye. A diagnostic sign is that the pupil, as a rule, is not so wide in such cases as it is in atropine-mydriasis. Instances, however, may occur in which the dilatation is just as wide, but in such cases the pupillary border usually is not regular in outline.

Ordinarily, the treatment is to be directed toward the cause. In the proper class of cases, the local uses of eserine and pilocarpine, with the constant or induced current, are to be employed.

Miosis is generally an accompaniment of inflammatory conditions of the brain and spinal cord, and of their membranes. It is also found in diseases of the cervical sympathetic. Intoxication with alcohol, tobacco, and opiates produces it; and, finally, it is seen in spasm of the accommodation. In proper cases, the treatment, besides being directed toward the cause, consists in the employment of atropine.

CHAPTER XII.

TREATMENT OF DISEASES OF THE CILIARY BODY AND THE VITREOUS HUMOR.

1. CYCLITIS (Iridocyclitis; Iridochorioiditis).

Cyclitis combined with iritis may occur in the form of a fibrinopurulent inflammation (pus in the vitreous humor) that may lead to panophthalmitis. It may also be met with in rubeola, scarlatina, variola, and cerebrospinal meningitis. It appears in a fibrinoplastic form in syphilis and tuberculosis of the ciliary body. In relapsing and typhoid fevers, it occurs in the form of a serous inflammation, with diffuse opacities in the vitreous humor, iritis, and reduction of intraocular pressure, followed by grave changes in the lens and the retina.

2. SYMPATHETIC IRIDOCYCLITIS

(Sympathetic Ophthalmia; Ophthalmia Migratoria.—*Deutschmann*).

The literature concerning this disease of the eye, produced by severe injury or the presence of foreign bodies in the other eye, is an extraordinarily great one, so that only the essential points can be mentioned here. Usually, the phenomena of a sympathetic cyclitis of the healthy eye appears in from four to eight weeks' time (rarely earlier) after an injury, especially in the ciliary body, or after the

entrance of a foreign body into the interior of the offending eye. The earliest symptoms in the sympathizing eye, are lacrimation, photophobia, ocular pain on palpation, and blurred vision (sympathetic irritation). These symptoms, as well as the ordinary recession of the near-point, however, need not be present. In recent cases, Schmidt-Rimpler has observed an active reaction of the iris for light and shade, the pupil of which is not miotic in type. In all injuries of this kind it is advisable, at least by the fourth week, to examine the second eye with the ophthalmoscope. The earliest sign of beginning affection in the second eye is hyperemia of the optic nerve-head. By some, it is stated that examination of the vitreous body will reveal the presence of fine opacities in the sympathizing organ.

Visual disturbances of the injured eye consist in slight reduction of central perception with diminution of the visual field. Both conditions, therefore, should be carefully studied. Posterior synechiæ, without the presence of circumcorneal redness or pain on palpation as a warning sign, may form insidiously. Later, the well-known symptoms of sympathetic iridocyclitis occur, and the disease pursues an acute, a subacute, or a chronic course.

In the treatment of cyclitic disease, it should be a rule that atropine is to be used in moderation. Since free exudates appear very early in the posterior chamber and lead to adhesion, atropine is of little or no value in most cases. According to some authors, an early iridectomy is capable of

preventing phthisis bulbi, while others advise against it, because vision, they say, becomes worse after its performance. If a cyclitic eye becomes blinded and is sensitive, it should be enucleated.

In a recent case of sympathetic ophthalmia described by Hirschberg[1], he employed the following treatment after enucleation of the injured organ: Rest in bed in a dark room, the instillation of atropine every second hour, the employment of leeches, and the use of mercurial inunctions. Later (which was repeated), atropine was used three times daily, followed several weeks afterward by another course of inunctions. After a week's rest, three weeks' use of mercurial inunction, followed by a course of sweating, was then given. After two and a half months' use of atropine, signs of increased intraocular tension appeared and vision sank to the ability to see to count fingers. At this period, pilocarpine was used subcutaneously and the eye was treated with lukewarm compresses. Quinine was given internally. At the end of three months' time, there was complete blindness from increased pressure. The pilocarpine injections were continued. Gradually, however, vision returned, the signs of pressure disappeared, and improvement was continuous until, at the end of a year's time, the patient was discharged with a normal field of vision and the ability to read Snellen IV at four

[1] "Centralblatt für praktische Augenheilkunde," "Sympathische Erblindung dauernd geheilt," Oct., 1891, S. 289.

inches' distance. Recovery persisted after twelve years' time. The same author publishes another case[1] in which, inunctions being unsuccessful, he employed Darier's subconjunctival corrosive sublimate injections in the strengths of one to five thousand. Several injections were made, but improvement did not occur until a month later.

In France, Abadie[2] likewise reports favorable results from these injections, which he made directly into the vitreous humor, using three drops of a one to five thousand strength solution of corrosive sublimate at intervals of eight days. However, he combined twelve inunction courses with the injections during the nine months' time of treatment.

A similar favorable result was obtained by Peunow[3] (Russia), with subconjunctival injections of one to two thousand strengths of corrosive sublimate.

3. OPACITIES IN THE VITREOUS HUMOR.

As it is the vessels of the ciliary body which chiefly nourish the vitreous body, diseases of the former are attended with disease of the latter. Such disturbances lead to a reduction in transparency of the vitreous humor, the opacities formed being either circumscribed or diffuse, movable or immovable. Opacities are produced by hemorrhages of

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[1] "Centralblatt für praktische Augenheilkunde," 1895, S. 82.

[2] *Ibidem*, 1894, p. 58, and 1892, p. 496.

[3] *Ibidem*, 1893, p. 569.

the chorioid and retina in high degrees of myopia (posterior staphyloma), in disturbances of the circulation from overexertion, and in syphilis and injuries. They also occur in the form of *muscæ volitantes* that are scarcely recognizable upon examination. These floating bodies are derived from the tissues of the vitreous body, and throw their shadows on the retina (Schmidt-Rimpler). They are not rarely seen in the anemias and chloroses of adolescence.

According to the intensity of the case, local remedies consist in the use of the artificial leech of Heurteloup or in instillations of iodide of potassium.

219. ℞. Potassii iodidi, ... 0|1 gm. (gr. iss)
Aquæ destillatæ, ... 10|0 c.c. (f℥iiss).
Misce et fiat solutio.
SIGNA.—Eye-drops. (Schmidt-Rimpler.)

Iodide of potassium, salicylate of sodium, or mercury should be administered internally. Laxatives and foot baths are also to be recommended. Finally, the constant current of about five elements' strength, with one electrode placed at the nape of the neck and the other held against the eyelid, should be employed.

Operative measures consist in paracentesis of the anterior chamber, performed, most probably, to hasten metabolism.

The opacities described under the name of *synechiæ scintillans*, which are produced by cholesterine crystals, do not demand any treatment.

At the present time, and in many countries, corrosive sublimate injections of one to three

thousand strength, repeated from three to ten times, are being made in cases of opacities of the vitreous humor. In such instances favorable results are being reported.

In the opacities occurring during the period from the fifteenth to the twenty-fifth years (Michel), and produced by disturbances in the composition of the blood, as in anemia, leukemia, chlorosis, syphilitic and tuberculous infections, the treatment is a causal one combined with the employment of pilocarpine or salicylate of sodium, for the purposes of diaphoresis. Sweating courses, for a few days at a time, should be given once a week. As after-treatment, Fuchs recommends saline mineral waters, such as the Marienbäder Kreuzbrunnen. Treatment of hemorrhage into the vitreous is practically the same.

4. INFLAMMATION OF THE VITREOUS HUMOR.

Suppurative inflammation of the vitreous humor (hyalitis suppurativa) is generally found to be a concomitant of purulent disease of the neighboring parts. However, circumscribed vitreous abscesses are also recorded.

Treatment is the same as that which is employed for suppurative chorioiditis. Berry [1] claims to have seen an improvement follow the injection of chlorine-water into the vitreous humor.

Tumors, parasites (cysticercus), and foreign bodies

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[1] "Centralblatt für praktische Augenheilkunde," 1892, S. 423.

in the vitreous humor, as well as detachment of the vitreous body, are not amenable to medicinal treatment. For the purpose of diagnosis, in such cases, atropine or some other efficient mydriatic, as previously indicated, is useful.

5. PANOPHTHALMITIS.

If a purulent inflammation of the vitreous humor or the ciliary body increases to such an extent as to affect the neighboring tissues (the chorioid, the sclera, or the cornea), the picture of panophthalmitis (suppurative chorioiditis) is produced. Intense edematous swelling of the lids and chemosis of the conjunctiva are, as a rule, sufficiently characteristic for differential diagnosis. The condition occurs not only after infection from traumatism, but it also follows systemic disturbance, such as general pyemia, typhoid fever, tuberculosis, erysipelas, and sinus thrombosis.

Treatment consists in the local employment of hydrotherapeutic compresses, such as chlorine-water, with the use of anodynes, narcotics, blood-letting from the temple, and ointments for the forehead. The method of incision into the sclera, as recommended by some authorities, is opposed by others. During the further course of the condition, small cataplasms of various kinds should be used. As, however, such treatment demands several weeks' time, during which period, the patient suffers greatly, early exenteration is frequently to be recommended to shorten the time for cure and to immediately put an end to the suffering.

CHAPTER XIII.

TREATMENT OF DISEASES OF THE CHORIOID.

1. GLAUCOMA.

The discussion of glaucoma may be considered here, since the condition mostly depends upon disturbances of circulation in the chorioid and ciliary body that lead to an increase of intra-ocular tension. As the treatment is principally operative, only the most important points, so far as medicinal intervention is concerned, can be referred to in this volume. The diagnosis and the pathological anatomy demand a few prefatory remarks, as often the family physician is the earliest one to observe the disease, he being, most frequently the first to be consulted by the patient.

If the patient presents himself with inflamed, weeping eyes; the veins of the conjunctiva overfilled and hyperemic; the pupil of medium width; the cornea slightly hazy; and if he complains of headache radiating to the forehead and temple (at times possessing the character of a migraine), suspicion of the possible existence of glaucoma should be aroused by these symptoms. If, to this symptomatic grouping, the tension of the bulb be found increased, the globe is harder than normal; if, ophthalmoscopically, the retinal arteries are seen to pulsate, the optic papilla is found to be excavated and the refracting

media are turbid; and, moreover, if the patient complains of the presence of colored rings about flames, and an examination shows a diminution in visual power, with a defect in the field of vision (which is most frequently the greatest toward the nasal side), the diagnosis cannot be in doubt, especially, if the history indicates that the ocular disturbance appeared suddenly, and that it was preceded by emotional excitement.

Pathologically, the glaucomatous attack is caused, in a measure, by a swelling of the ciliary body, as a result of which the iris and the cornea are pressed against each other and the pectinate ligament is closed, so that the outflow of aqueous humor is prevented,[1] the result being an increase in tension. By the miotic action of eserine the ciliary body is stretched and the part of it which had become apposed to the cornea in the dangerous region, becomes free. This explanation also gives partial reason why, in chronic glaucoma, eserine is no longer of value, since adhesions have formed at the previous points of contact.

There are many cases, however, in which the characteristic symptoms of glaucoma are either absent or barely traceable. There may not be any irritation and injection, while the diminished visual acuity and the ophthalmoscopic findings may indicate disease of the optic nerve (atrophic excavation).

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[1] This is the explanation given by Knies and Weber; but it does not apply to all cases (Fuchs).

If, however, with such symptoms present, the patient should declare that the onset of the disease had been in the form of a sudden attack, that the exacerbations occurred in paroxysms, and that during these attacks other phenomena were present, the condition may be considered as having been glaucomatous in type. The existence of increased tension will have to be assumed, and iridectomy, as a rule, should be proposed in order to preserve any remaining vision. Between these two extremes, various gradations of glaucoma that are described under the names of acute, fulminating, hemorrhagic, malignant, and absolute may be found.

The following type of cases, which at times presents itself, is also important in practice. A subject who has deeply-seated circumcorneal injection, with contracted pupil, lacrimation, pain, and diminished vision, is seen. Atropine is prescribed, and the patient is ordered to return. He does so. The appearance of the eye is about the same, though the pupil is smaller. Vision is perhaps somewhat worse. Treatment is continued until at last the patient says, "I can no longer see." It is a picture of secondary glaucoma. If the patient is carefully examined by oblique illumination and the ophthalmoscope, the reason why atropine has not acted, will be immediately found. At times, even when the eye is in this condition, it is still possible to restore, in part, the visual power, which may have fallen to the ability to see to recognize hand-movements, by means of eserine.

At present, there seems to be a revulsion in regard to the treatment of glaucoma. While in the acute form immediate iridectomy is considered as being indicated, and while in chronic glaucoma it is the ordinary opinion that only an iridectomy or a sclerotomy can preserve the visual power, opinions are heard declaring that glaucomatous eyes may be preserved without operative interference. Cohn [1] (Breslau) states that he has obtained cures in acute as well as in chronic glaucoma by the use of eserine alone. In regard to its employment, he lays down the following rules:

(1) In every case of glaucoma, eserine should be used. (2) Attention should be paid to the early symptoms and the prodromal phenomena. (3) Only when eserine fails should iridectomy be performed.

The use of eserine, which was introduced into ophthalmic practice by Laqueur in 1870, should consist, according to Schmidt-Rimpler, in the instillation of a few drops of a half per cent. strength solution into the conjunctival sac from two to six times daily (see formulæ 70, 217, 217*a*). If it is not well borne, pilocarpine may be substituted (*vide* formula 71).

Silex [2] cautions against the prolonged use of eserine, since the opportune time for the preservation of good visual power is thereby lost, and iridectomy is performed under unfavorable circum-

[1] "Berliner klinische Wochenschrift," 1895, Nr. 21, S. 453.

[2] "Deutsche Aerzte-Zeitung," Nr. 14, 1895.

stances. Hirschberg also recommends eserine only as an adjuvant, and not as a curative agent. Besides iridectomy, sclerotomy is practised.

General treatment consists in directing a healthy mode of life, the lessening of any existing plethoric conditions, and in cases in which rheumatic diathesis or neuralgia is present, the use of quinine in two-tenths of a gram (gr. iij) dose several times a day.

If, in cases of hemorrhagic glaucoma, diabetes, cardiac, renal, and hepatic disease, or syphilis be present, treatment directed toward the cause should be instituted. Above everything, rest, eserine, and venesection, with the internal administration of iodide or bromide of potassium, should be tried.

If severe glaucomatous attacks occur, more active instillations of eserine, hot compresses, bleeding from the temple, with the internal administration of chloral hydrate, are all indicated. Iridectomy is not wise in this condition, since it may lead to extensive internal hemorrhage. Paracentesis of the anterior chamber or sclerotomy is better (Bourgon, Risley [1]).

Lavagna [2] has reported on a new miotic known as *arecolin*. It is true that the study of its use is in the experimental stage, but it would unquestionably be a great gain for ophthalmic practice if this remedy would prove valuable, since eserine is not always well borne and pilocarpine is not a perfect substitute

[1] "Centralblatt für praktische Augenheilkunde," 1894, S. 191.

[2] "Therapeutische Monatshefte," July, 1895, "Experimentelle Notizen über Arecolin."

for it. Arecolin, the alkaloid of the areca-nut, was prepared by Merck,[1] in Darmstadt, in 1894, in the form of a bromide ($C_8H_{18}NO_2BrH$). Like pilocarpine, it has been found to act as a sialagogue. It has, therefore, seemed reasonable to test its action upon the eye.

Lavagna found that a single drop of a one per cent. strength solution introduced into the conjunctival sac of an eye produced lacrimation and spasm of the lids lasting for about one minute's time. After two minutes' interval, the pupil became small, the maximum contraction, which continued for thirty minutes' time, being reached in ten minutes' time. After an interval of an hour and a half, the action had passed off. Even when several times repeated, the remedy did not produce headache.

2. CHORIOIDITIS DISSEMINATA.

Fibrino-purulent inflammation of the chorioid has already been referred to under the term panophthalmitis, while fibrino-plastic inflammation of the chorioid has been spoken of as irido-cyclitis or irido-chorioiditis. It only remains, therefore, to take notice of serous exudative chorioiditis (Michel), exudative chorioiditis (Schmidt-Rimpler), and disseminated chorioiditis (Schweigger). Dependent upon the form, the location, and the etiology of this affection, the following varieties are differentiated: Chorioiditis

[1] Merck, "Bericht für das Jahr 1894," S. 42.

areolaris, circumscripta, macularis, centralis, equatorealis, and syphilitica, as well as chorio-retinitis. This disease of the chorioid is characterized by the appearance of whitish-yellow spots, paling of the pigment layer, and aggregations of dark, irregular pigmentation at the foci of inflammation.

It has been found that the more central the foci of disease are located, the greater are the visual disturbances. If they are situated in the region of the macula (macular chorioiditis), direct vision is greatly impaired. The patients also complain of the light, and of blurring and distortion of objects (metamorphopsia). Scotomata may be present.

Aside from diminution of vision, there is a subjective symptom, "flickering," which is important in the diagnosis. If hyperemia of the optic nerve-head is present, it is wise to examine the peripheral parts of the chorioid with the ophthalmoscope while the pupil is artificially dilated. The existence of opacities in the vitreous humor and changes in the peripheral portions of the chorioid will confirm the diagnosis. If large, white patches are already present, a diagnosis of the condition is not difficult. The prognosis in all cases, with the exception of the syphilitic form, is unfavorable.

Treatment in acute cases consists in placing the patients in darkened rooms and in using mercurial inunctions. Lewin's corrosive sublimate injections, in doses of one-tenth of a gram (gr. $\frac{3}{20}$) per day, may be of value. Injections of pilocarpine or the internal administration of salicylate of sodium in

two-gram (gr. xxx) doses are also useful. Later, atropine once daily, and the Heurteloup leech every four or six days, should be employed (Schmidt-Rimpler). Nothing can be expected from these remedies in chronic cases. Michel considers them valueless. In his opinion, ophthalmologists frequently find it difficult to relinquish antiquated therapeutic measures in this disease, and consider it essential that the patient should be treated in dark rooms. Experience in practice does not favor this assertion. The author, however, knows of patients with extensive chorioiditis who invariably are blinded by bright daylight, and are forced to wear dark coquilles.

In ambulatory cases, corrosive sublimate pills should be given internally in small doses (formula 36). Near-work should be suspended. Iodide of potassium and, in cases of anemia, iodide of iron should be prescribed. If venesection is to be performed in cases of congestion of the head, the patient should remain for at least a day in a darkened room.

In Russia,[1] great success has been claimed for corrosive sublimate injections, especially in the syphilitic forms, the amount used being one to three thousand strengths for some three to ten times. Hirschberg[2] has seen good results from the injections made after the method of Abadie-Darier.

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[1] "Centralblatt für praktische Augenheilkunde," 1894, S. 58. Peunow.

[2] *Ibidem*, 1893, p. 267.

CHAPTER XIV.

TREATMENT OF DISEASES OF THE RETINA.

1. RETINITIS SIMPLEX.

Dictyitis serosa of Schmidt-Rimpler arises when, to a hyperemia of the retina and the optic nerve-head, a grayish discoloration of these tissues is added. The boundary of the optic disk is blurred and indistinct. The diagnosis, however, is difficult, since corneal and vitreous opacities may produce a similar ophthalmoscopic picture. For purposes of differential diagnosis, therefore, several associated conditions must be taken into consideration. The following forms are described under the head of serous retinitis:

1. *Retinitis Nyctalopica* (*Arlt*).—In this affection, the patient complains of a reduction and a cloudiness of vision. The cause, usually, is excessive light-stimulus.

2. *Retinitis Syphilitica.*—This form of disease is generally accompanied by opacities of the vitreous humor and is complicated by iritis and chorioiditis. Micropsia, metamorphopsia, and scotomata are all present.

3. *Commotio Retinæ.*—This, which is also designated retinitis traumatica, is generally produced by injuries made with dull objects. It is characterized by a whitish-gray, edematous turbidity of the retina in the posterior pole of the eyeball. The symp-

toms, as a rule, consist in a reduction of visual power and the presence of a scotoma.

4. *Retinitis Macularis.*—This condition evidences itself by an obscuration in the central portion of the visual field (central scotomata). It has often been observed during solar eclipses. The principal cause is said to be gazing into the direct light from the sun with insufficiently protected eyes. Practically, the effect is a direct singeing of the outer retinal layers. Electric light is said to produce corresponding changes.

The treatment of all these forms of retinitis is causal and general. Very frequently, however, attention paid to the general disease is the more important.

Protection of the eyes against light is the principal local indication. The patient, therefore, should remain in the dark. In recent cases, the use of the artificial leech of Heurteloup and the sweat-cure, with the aid of two grams (gr. xxx) of salicylate of sodium, taken at night in a single dose, are important.

If the case proves to be a severe one of syphilitic origin, with complications and marked reduction of vision, either corrosive sublimate injections in one-tenth of a gram (gr. $\frac{3}{20}$) doses daily or inunctions of gray ointment, four grams (℥j) daily, with the simultaneous administration of calomel twice daily, should be employed. The after-treatment in such instances, consists in the administration of iodide of potassium, or—

220. ℞. Hydrargyri iodidi, ... 0|25 gm. (gr. iii $\frac{4}{5}$)
Potassii iodidi, ... 2|5–4|0 gm. (ʒ ss, gr. viij ad ʒ j)
Aquæ destillatæ, ... 10|0 c.c. (f ʒ iiss)
Syrupi, ... 50|0 c.c. (f ʒ j, f ʒ v).
Misce.
SIGNA.—Teaspoonful one to three times daily. (A. von Graefe.)

The patient should remain in a darkened room.

In the after-treatment of macular retinitis, hypodermatic injections of strychnine, in doses of from one to two mg. (gr. $\frac{1}{100}$ to gr. $\frac{2}{100}$) have been usefully employed.

221. ℞. Strychninæ nitratis, ... 0|02 gm. (gr. $\frac{3}{10}$)
Aquæ destillatæ, ... 10|0 c.c. (f ʒ iiss).
Misce.
SIGNA.—Poison. For injection-purposes. One-fourth to one-half of a hypodermatic syringeful to be injected into the temporal region.

In all cases, authorities are agreed as to the value of saline laxatives in the beginning of the treatment. Concerning general therapy in syphilitic cases, see chapter v. Von Graefe was in the habit of applying to the forehead or the temple the following ointment:

222. ℞. Extracti hyoscyami, ... 0|6 gm. (gr. ix)
Extracti opii, ... 0|3 gm. (gr. ivss)
Unguenti hydrargyri cinerei,[1] . 4|0 gm. (ʒ j).
Misce et fiat unguentum.
SIGNA.—Ointment for forehead. (von Graefe.)

2. RETINITIS PARENCHYMATOSA.

If to the opacification of the tissues of simple serous retinitis, circumscribed changes in the retina,

[1] German Pharmacopeia. Unguentum hydrargyri ammoniati, U. S. P., may be substituted.

such as whitish spots, striæ, thickening of the vessel-walls, exudates and hemorrhages, be added, the picture of retinitis parenchymatosa is obtained. The whitish spots are supposed to be foci of fatty granular cells, and the whitish linear opacities are believed to consist of points of fatty degeneration of the ends of the radiating fibers.

This form of retinal disease is met with in acute nephritis (also in scarlet fever), chronic nephritis, diabetes, anemia, and leukemia, as well as in retinal hemorrhages and chorio-retinitis. The optic nerve may also be affected in the process, which, since diseases of the blood-vessels are being dealt with, is *a priori* to be expected.[1]

The classification is based upon the cause and the course of the disease. Writers also speak of neuro-retinitis albuminurica and chorio-retinitis albuminurica.

Silex[2] describes the ophthalmoscopic picture of retinitis albuminurica gravidarum as follows: The retina is turbid, the boundaries of the optic disk are obscure, the papilla itself is often swollen, and the retinal veins are dilated and tortuous. The retinal arteries are contracted, have a whitish contour, and, if examined ophthalmoscopically by the direct image, show a change in their vascular reflexes. The retina presents whitish, glistening spots, which at times, become stellate in shape in the region

[1] Carl Herzog in Bayern, "Ein Beitrag zur pathologischen Anatomie des Auges bei Nierenleiden," 1887.

[2] "Berliner klinische Wochenschrift," 1895, Nr. 18.

of the macula. From these signs, the diagnosis of a renal affection may be made. If pregnancy exists, the so-called "the kidney of pregnancy" may be diagnosticated, and the condition, if left unchecked, may gradually lead to blindness.

The treatment of this form is similar to that for the simple variety of retinitis. In recent cases, therefore, the patient should be kept in a darkened room and the Heurteloup leech is to be used every fourth or fifth day. If vision is not improved, the use of the leech should be suspended, and the sweat-cure, with the simultaneous internal administration of iodide of potassium or mercury preparations, is to be immediately substituted. As a counterirritant, tincture of iodine or Arlt's ointment may be applied to the temple (formula 73).

In cases of anemia and albuminuria, venesection and the dark room are both contraindicated. Instead of these, dark glasses and roborants are to be employed. Michel recommends only causal general treatment, using instillations of physostigmine in one-half of one per cent. strength solutions (formula 70) locally into the conjunctival *cul-de-sac*. This he does in order, by reduction of the intra-ocular pressure, to favorably influence the conditions of the circulation of the affected retina.

If retinitis develop during the course of chronic renal disease in pregnancy, and there is danger of blindness, Silex advises the induction of premature labor and delivery, since the prognosis as to the restoration of vision in such cases is uncertain, it

being especially bad when hyaline changes of the vessel-walls are present. After the termination of delivery, warm baths, with subsequent hot packs to provoke perspiration, derivation by the bowels, diuresis, proper diet, and appropriate tonics constitute the correct treatment. Venesection should not be performed. Finally, the question of the prevention of future pregnancy must be considered.

3. RETINITIS PIGMENTOSA.

This form of retinitis offers but few difficulties in diagnosis. The bone-corpuscle-like pigment-spots partly covered in some places by the retinal vessels, and in other situations covering them, give the retina a typical appearance. In addition, there are the characteristic clinical symptoms. Almost without exceptions such patients have an extraordinary degree of concentric contraction of the visual field, with preservation of good central vision. They see, for example, a door-latch, but stumble over every adjacent object in their efforts to reach for it. They are, as has been said, so situated as if seeing through an inverted telescope. As a rule, with the beginning of twilight their vision becomes worse (night-blindness). The disease begins in childhood and is frequently combined with other abnormalities, such as partial deafness and deaf-mutism.

Prognosis is unfavorable. Treatment consists in sweat-cures, blood-letting, injections of strychnine,

and the employment of the constant current. Grandclément[1] claims to have seen improvement from hypodermatic injections of antipyrine.

4. RETINITIS HÆMORRHAGICA (Hemorrhagic Retinitis).

Hemorrhages in the retina are of practical importance diagnostically because they may occur in quite a number of diseases of the internal organs. Small extravasations are known as retinal apoplexies; larger ones are designated as hemorrhages. The latter are usually combined with marked turbidity of the retinal tissue. These hemorrhages occur after traumatism, in empyema, especially when the cough is violent. They are also seen after epileptic attacks, and in purpura hæmorrhagica, scurvy, and diseases of the liver in which there is well-pronounced cholemia.

They also appear in cases of extensive burns of the skin, and are often found in pernicious anemia, leukemia, septicemia, valvular diseases of the heart, and menstrual disorders. Visual disturbances are frequently quite marked.

As a consequence of retinal hemorrhages, the picture of retinitis proliferans is, according to Michel, later developed. It is characterized in part by white or bluish-white stellate bands of fibrous connective tissue radiating in the vitreous humor, and

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 30.

at times resembling slightly the appearance caused by the presence of a cysticercus.

Defects in the central portions of the visual field are said to be the first disturbances, the disorder usually affecting comparatively young subjects. Cardiac hypertrophy, syphilis, and diabetes are given as the most prominent causative factors.

The treatment is, first of all, causal. If the hemorrhages have been produced by trauma, pressure-bandages, cold, rest in bed, and aperients are indicated, everything being done to avoid anything that favors congestion. Derivatives, such as blood-letting, Arlt's ointment, and iodine to the forehead and temple, are all to be recommended. Injections of ergotine have also been employed. Inunction-treatment is only advised when syphilis exists. In syphilitic cases, Michel recommends the use of iodide of potassium.

5. DETACHMENT OF THE RETINA.

The most prominent clinical symptom in this affection is a sudden disturbance of vision, varying in degree from a mere reduction of visual power to almost, if not quite complete, blindness. The most prominent causes are injuries (such as sudden pressure or a blow with a dull object), myopia, intraocular tumors, entozoa (cysticercus, etc.), chronic inflammations of the chorioid, the iris, the ciliary body and the vitreous humor, and all ocular diseases that may lead to atrophy of the intraocular tissues. In

many cases, the cause is not obtainable. If it is evident that arduous bodily labor, such as the carrying of heavy burdens, has produced the detachment, especially in old subjects,[1] immediate treatment would render the prognosis, as in all cases of traumatism, more favorable.

According to Samelsohn, the pressure-bandage is employed both in Northern and in Southern Germany. Injections of pilocarpine (*vide* formula No. 71), the use of the Heurteloup artificial leech, and laxatives are also recommended. The duration of treatment ought not to exceed more than one or two weeks' time. Schöler has successfully used iodine injections, and Hirschberg has performed puncture of the sclera.

In recent cases, treatment is begun with the application of a bandage. The patient should be placed in bed. Artificial blood-letting may be performed. Daily inunctions of four grams (ʒj) of gray ointment are to be made, and two grams (gr. xxx) of salicylate of sodium are to be given the patient at night. This treatment usually occupies from three to four weeks time. If the effect of the salicylate of sodium is inadequate, diaphoresis must be secured in other ways. The pressure-bandage should be daily renewed, and milk should be consumed in large quantities.

At the International Congress at Rome, in 1894,

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[1] "Klinische Monatsblätter für Augenheilkunde," März, 1895. "Beitrag zur Aetiologie der Netzhautablösung vom Verf."

Gradenigo[1] reported the case of the cure of a recent retinal detachment in a few minutes' time by massage. This is probably a most exceptional instance. The after-treatment consisted in the internal administration of iodide of potassium.

In France[2], the treatment consists in (1), light pressure-bandage; (2), rest in bed; (3), pilocarpine-injections three times daily; (4), hot compresses; and (5), milk diet. The duration of this treatment should continue for eight days.

In the last two years, several ophthalmologists have used electrolysis with success. In Germany, Schöler[3] has made himself very prominent in its praise, while in France, Abadie[4] has been one of its chief exponents. While experimenting with animals, the former investigator observed that the electrical current produces precipitation and coagulation of the albumin. Delicate knives, two to three millimeters in length and one and a half millimeters in width, or tenotomy hooks with needle points two and a half millimeters long, were inserted into the eyeball. A Hirschmann's immersion battery was employed, the negative pole being placed in a position corresponding to the vertical meridian of the eyeball, and the positive one to the horizontal meridian. At first, a single element, then two or three, were used for not longer than periods of fifty

[1] *Ibidem*, 1894, p. 200.

[2] "Centralblatt für praktische Augenheilkunde," 1891, S. 432.

[3] "Klinische Monatsblätter für Augenheilkunde," 1893, S. 215.

[4] "Centralblatt für praktische Augenheilkunde," 1894, S. 429.

seconds' time. Within four days, the retina had resumed its normal position.

Terson [1] (Toulouse) has written an extended communication concerning the use of electrolysis after the method of Abadie. He employed a current of five milliamperes' strength from the positive pole of a battery through a needle of "*platine iridié.*" Schöler introduces both poles. Abadie makes use of the positive one, while van Moll employs the negative. Recently, Deutschmann has recommended an operative procedure which practically consists in the injection of fresh vitreous humor of rabbits' eyes into the human eye.

6. EMBOLISM OF THE CENTRAL ARTERY OF THE RETINA.

In cases of this kind, there is, as a rule, either a sudden total blindness or a reduction of central vision that is accompanied by defects in the visual field. The condition usually occurs in atheroma late in life, but has been observed at an early period in subjects with cardiac affections.

Formerly, iridectomy or paracentesis of the anterior chamber was performed, this being done in order to reduce intraocular pressure. At the present time, massage, according to the method of Mauthner, is recommended by some. The plan consists in the splitting of the conjunctiva, with the

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[1] "Annales d'Oculistique," July, 1895.

introduction of a tenaculum into the orbit up to the optic nerve, at which point massage is made. In Hirschberg's clinic, Perles reports favorable results from external massage. The eye is cocainized, because the procedure, if energetically performed, is painful. This treatment should be continued twice daily for two weeks' time. Other cases are treated with mercurial ointment and the internal administration of iodide of potassium.

CHAPTER XV.

TREATMENT OF DISEASES OF THE OPTIC NERVE.

1. CHOKED DISK.

Under the terms papillitis, neuritis optico-intraocularis (Schmidt-Rimpler), neuroretinitis, or retinitis (Schweigger) is understood that an ophthalmoscopic picture of hyperemia, cloudiness and swelling at the point of entrance of the optic nerve, is present. The optic nerve-head projects beyond the level of the retina, while the retina itself is evidently pathologically affected only in the immediate neighborhood of the disk.

Despite such an ophthalmoscopic picture, which almost always indicates circulatory disturbances

within the cranial cavity, visual power may be almost normal. A sudden transition, however, to complete blindness may occur at any time.

As the condition is generally associated with cerebral disease, this form of optic-nerve disease often becomes of immense diagnostic value.

Treatment.—For the relief of severe headache at times accompanying the condition, Schmidt-Rimpler has satisfactorily employed the seton. In order to improve the circulatory conditions, de Wecker has incised the sheath of the optic nerve. Injections of pilocarpine have also been used.

Hirschberg[1] has seen a favorable termination of the condition despite the diagnosis of a cerebral tumor, and states that if there is no fixed disturbance of vision or contraction of the visual field, prognosis is favorable. According to the same author, the chief cause is tertiary syphilis—that is, cerebral gummata. Treatment consists in energetic inunctions with gray ointment, four to six grams (℥j ad ℥iss) daily, together with the internal administration of iodide of potassium. This method should be instituted even when no specific history can be obtained.

223. ℞. Hydrargyri chloridi corrosivi, . . 0.15 gm. (gr. ij)
Aquæ destillatæ,
Pulveris et succi liquidi, . . āā q. s.[2]
Misce et fiant pilulæ xxx.
SIGNA.—Two pills daily.

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 289.

[2] Other excipients can be substituted.

2. ATROPHY OF THE OPTIC NERVE.

Clinically, it should be noted that there are several forms of atrophy of the optic nerve: a partial, a total, a stationary, and a progressive. Nearly all of the partial varieties of atrophy are stationary in character, and their prognosis is generally favorable. Their cause is usually traumatic in nature. It happens, however, at times, that even in total atrophy of the optic nerve, vision is not seemingly disturbed in proportion to the apparent ophthalmoscopic findings. Therefore, treatment is not entirely hopeless.

Prognosis should be guarded. Cases have occurred in which vision to the extent of one-sixth of normal ($\frac{6}{36}$) has returned and remained stationary for years. The author observed this in a patient who had apparently acquired rheumatic neuritis, and in a three-year-old child who, in consequence of a hydromeningitis, presented an ophthalmoscopic picture of total bilateral optic-nerve atrophy. Both cases had been considered in a number of eye-clinics as hopelessly blind. More unfavorable are the instances of progressive amaurosis that are found in gray degeneration of the optic nerve, and are seen in cases of syphilitic spinal-cord and brain lesions (progressive paralysis) as have been so well described by Leber.

In the treatment, the constitutional disease must be always considered. If syphilis is present, anti-syphilitic treatment should be instituted (*vide*

Chap. v). Schmidt-Rimpler,[1] however, advises caution, as the history is often doubtful, and energetic mercurial inunction-treatment in posterior spinal sclerosis or in diffuse disease of the central nervous system may readily do harm. In such cases, the treatment should be a roborant one. Some books recommend a sojourn of the patient in the mountains. Among the most important remedies, nitrate of silver and iodide of potassium, as well as the constant current with the cathode placed upon the closed lid and the anode on the nape of the neck, should be recommended.

If the disease depends upon a cerebral lesion, treatment can only be symptomatic. In such cases, derivatives and iodide of potassium are indicated.

If partial optic-nerve atrophy follows inflammation of the nerve, injections of strychnine in doses of from one to two milligrams (gr. $\frac{1}{100}$ ad $\frac{3}{100}$), according to Michel,[2] may be tried. This author, nevertheless, considers the drug useless. He believes that the so-called rheumatic optic neuritis with atrophy is dependent rather upon nephritis or tuberculosis than upon exposure to cold. He recommends the use of both the constant and the faradic currents.

3. RETROBULBAR NEURITIS.

The clinical symptoms of this disease are swelling of the eyelids, frontal pains, tenderness of the globe

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[1] "Augenheilkunde," 1889, S. 262.

[2] "Lehrbuch der Augenheilkunde," 1890, S. 517.

on palpation, and reduction of central vision. In the acute forms of inflammation of the optic nerve, which Schmidt-Rimpler terms a genuine inflammation of the optic nerve, sudden blindness, without the ophthalmoscope showing any changes that are proportionate to the great disturbance of vision appearing during the course of from a few hours' to several days' time, will be found. Cases of acute blindness in which vision gradually returns, are also met with.

The usual causes are febrile diseases, syphilis, uterine disorders, lead-poisoning, cold, gastric catarrh, and angina. The ophthalmoscope shows only slight opacity and hyperemia of the optic nerve-head. Another cause, especially seen in children, is the presence of miliary tubercles situated in the arteries of the optic nerve.

The chronic variety of this type of inflammation of the optic nerve, which occurs more frequently in men, constitutes a transition-form to optic-nerve atrophy. It is observed in diabetes mellitus, in poisoning with tobacco and alcohol, and other toxic agents, and after blinding from excessively bright sunlight ; the pathological cause being most probably situated in the vessel-walls.

Treatment is causal as well as general and local. If there is a history of exposure to cold, salicylate of sodium given internally, or hypodermatic injections of pilocarpine are advisable. If constitutional disturbances are present, injections of corrosive sublimate should be employed. In both instances,

the after-treatment should consist in the use of iodide of potassium. Locally, in recent cases, if anemia is not present, the artificial leech of Heurteloup should be employed. Later, Arlt's ointment may be used, and, finally, hypodermatic injections of strychnine, in doses of one to two milligrams (gr. $\frac{1}{300}$ ad gr. $\frac{1}{100}$) each, should be made into the temple.

In toxic amblyopias, which are principally characterized by central scotoma and characteristic blindness or dimness of vision for green and red, the treatment in strong individuals, should begin by bleeding by means of the Heurteloup leech, followed by the employment of sweat-cures and the use of laxatives (Carlsbad salts). In the after-treatment, electricity locally applied and hypodermatic injections of strychnine[1] into the temporal regions are to be used.

Hysterical amblyopia may present similar symptoms to acute retrobulbar neuritis (see p. 205), but this form of amblyopia is characterized by the fact that the scotomata are constantly changing, while those that are found in retrobulbar neuritis remain, as a rule, fixed for long periods of time. According to Fuchs, injections of strychnine are also especially valuable in these cases.

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[1] Strychnine stimulates the optic nerve. This is evidenced by an increase in the visual acuity in the normal-eyed (Fuchs). This author gives one-half to one Pravaz-syringeful of a solution of one-half to one per cent. strength daily,—this dose equaling 0.005 gram (gr. $\frac{7}{100}$).

CHAPTER XVI.

TREATMENT OF AMBLYOPIA AND AMAUROSIS.

1. AMBLYOPIA.

There is a series of special physiologic or visual disturbances that has not been included in the consideration of the diseases of the parts of the eye thus far described. They constitute a particular class and demand special treatment.

In the diagnosis of the amblyopias, the power of central vision, the accommodation, and the refraction, as well as the extent of the visual field and the condition of the color-sense, should be tested.

Under the term congenital amblyopia, are included all those cases in which a slight reduction in central vision is present. This is most frequently found in cases of pronounced hypermetropia, or in cases in which unilaterally, there is only sufficient vision for finger-counting, this being complicated by strabismus (amblyopia exanopsia). Treatment, where possible, should consist partly in optical adjustment with correcting lenses, and partly in monocular use of the imperfectly functioning organ.

A form of amblyopia from want of use is also observed in old corneal opacities. In such cases, an optical iridectomy or a tattooing of the cornea becomes the requisite treatment.

In toxic amblyopias, defects in the visual field char-

acterized by the appearance of central scotoma for green, red, and blue, as proved by perimetric examination, constitute typical symptoms. The color-sense should always be tested in these cases. Such defects are observed in alcohol- and lead-poisoning, diabetes, and toxemia following the ingestion of large doses of quinine.

Peripheral defects in the visual field in which there is loss of an entire half of the field occur, and are described under the names of homonymous or heteronymous hemianopsia. In the former, there is a loss of one-half of the visual field of the eye, either on the right or the left side, without any reduction in central vision. The condition may arise with symptoms of an apoplectic attack, vertigo, stupor, and nausea. The causes are believed to be a disturbance or lesion of one of the occipital lobes or of the optic tracts from apoplectic cysts, tumors, injuries, etc.

Heteronymous hemianopsia affects either the temporal or the nasal halves of the visual fields. The dividing lines are not so strictly identical, and the acuity of vision, as a rule, is impaired. The phenomenon is associated with severe headaches and generally with paralytic phenomena in the distribution of the third and fourth cranial nerves. The causes are tumors of the base of the brain corresponding to the position of the chiasm. Traumatism and syphilis are also causal factors.

The treatment of the visual defect is always an etiological one. As a rule, antisyphilitic measures are to be recommended.

In 1865, von Graefe described, under the name of "anesthesia retinæ," a form of amblyopia in which, in addition to reduction of visual acuity, there existed a pathologic sensitiveness to light with concentric contraction of the field of vision. This disturbance is most commonly found in women and children, and is associated with other affections, such as neurasthenia, hysteric anesthesia, and hyperesthesia. Such patients are easily blinded by light, but the wearing of dark glasses and living in subdued light produce improvement both in visual power and the field of vision. In regard to the cause of this condition, sudden emotional disturbances are assigned. Prognosis is favorable.

Treatment consists in the use of tonics. In addition to preparations of iron, the following formula may be recommended:

224. ℞. Zinci lactatis,[1] . . . . . 0.06–0.1 gm. (gr. $\frac{1}{10}$ ad gr. iss)
Sacchari albi, ... 0.5 gm.

(Schweigger.)

Later, injections of strychnine,[2] in doses of 0.003 gram (gr. $\frac{1}{100}$) each, are indicated. During the first week, the patient should be kept in a darkened room, so arranged that there shall be a gradual increase made in the illumination. Dark glasses should be worn. The constant current is to be recommended. In cases of neurasthenic asthenopia, Förster has recommended the use of musk, valerian,

[1] This salt is not official in the Pharmacopeia of the United States of America.

[2] "Centralblatt für praktische Augenheilkunde," 1893, S. 32.

and acetate of zinc. Such patients should avoid remaining in darkened rooms.

Traumatic anesthesia of the retina is a condition resembling the one just described. In consequence of its medico-legal aspect, it is of special importance, and has received much attention since Oppenheim discussed it in 1889. It is known under the names of traumatic retinal anesthesia or hyperesthesia, and traumatic amblyopia or nervous asthenopia following trauma. As diagnostic signs, it is said to present concentric contraction of the visual fields, combined with a reduction in central vision, the latter being improved in a dim light. This condition, which may last for several months' time, is looked upon as a fatigue-symptom (Wilbrand).[1] Cramer[2] has observed this affection to occur unilaterally after severe head injury. The clinical symptoms in his case consisted in photophobia and weakness of vision. Examination showed contraction of the visual field. He believed that the cause was hemorrhage into the sheath of the optic nerve, produced by *contre coup*. Treatment consisted in the wearing of blue glasses with the internal administration of iodide of potassium.

Night-blindness also belongs to the amblyopias that at times occur without any ophthalmoscopic findings. Such patients usually see well in bright daylight, but even in twilight, they cannot see to

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1 "Sitzungsbericht der Ophthalmologischen Gesellschaft zu Heidelberg," 1891, "Berliner klinische Wochenschrift," 1891, Nr. 31.

2 "Monatsheft für Unfallkunde," 1895, Nr. 3, S. 74.

readily help themselves (torpor retinæ). By some, the cause is supposed to be protracted exposure of the eye, in weakened individuals, to too strong a light. It has also been observed as a characteristic sign of retinitis pigmentosa, and it occurs in some forms of chorio-retinitis. The condition is most commonly found in prisons and on board ships, as well as in communities that are affected with scurvy (Schweigger). At the present time, the disease is rare.

Treatment demands the use of dark glasses, the ingestion of good food, and the administration of iron and quinine. By some, cod-liver oil is considered to have a specific action upon the condition. The constant current has also been employed.

Grandclément [1] has seen excellent results from the injection of antipyrine, but does not state the dose that is employed.

Day-blindness is the opposite condition to the one just described. The patients see better in dim light and there is no contraction of the visual field. The causes are easily recognized—mydriasis, albinism, coloboma of the iris, diseases of the retina and optic nerve, etc. (Schmidt-Rimpler).

Treatment is causal and symptomatic. Dark glasses should be worn.

Under the head of scotoma scintillans or amaurosis partialis fugax, a condition is described in which the patients constantly complain of rapid scintilla-

[1] "Centralblatt für praktische Augenheilkunde," 1891, S. 126.

tion in one-half of the visual fields. The condition appears paroxysmally and lasts a brief time. The attack is accompanied by headache and migraine. Ophthalmoscopically, a spontaneous arterial pulse is sometimes visible.

As the condition is usually dependent upon central nervous disturbance, antipyrine and antifebrine are among the chief remedies. Hilbert[1] has employed inhalations of nitrate of amyl with success, and other authors have used the bromides and laxatives to advantage.

As a sympathetic neurosis, a condition of the other eye in which amblyopia with hyperesthesia of the retina of one eye is sometimes found. In other cases, an irido-cyclitis is present in the fellow-eye. The symptoms are similar to those of traumatic neurosis, and, at times, indicate enucleation of the primarily diseased organ as the best treatment. In this type of cases, the disappearance of the phenomena after an operation permits the inference that they are sympathetic in character.

2. AMAUROSIS.

Sudden blindness at times, is observed in intracranial conditions, in which improvement, even after several weeks' duration, may occur. Treatment is causal, consisting in the use of mercurials and laxatives, and later, the employment of iodide of potassium.

There are certain forms of amaurosis—as, for ex-

[1] *Ibidem*, 1891, p. 330.

ample, that seen in uremia—in which there are not any visible ophthalmoscopic changes. A similar character of blindness may be seen in combination with albuminuric retinitis, and in typhoid fever, scarlatina, hematemesis, intestinal hemorrhages, hemorrhages after delivery and, in fact, after all manner of cases in which there are severe losses of blood.

Treatment and prognosis depend upon the presence and condition of the iridic reaction. So long as this exists, mercurial inunctions, derivatives, and injections of strychnine, may be usefully employed.

Hirschberg[1] has successfully relieved blindness following hemorrhages with ergotine and iron. The quinine amaurosis[2] of the tropics is best treated with inhalations of nitrite of amyl, stimulants, and cold douches, with rubbing, followed later, by injections of strychnine into the temples and cold baths.

When the amaurosis is dependent upon an optic nerve atrophy, as, for example, in posterior spinal sclerosis, Weiss[3] claims to have used the galvanic current with good results. One pole is placed on the occiput and the other is held on the closed eyelids. A current of the strength of two milliamperes is used for fifteen minutes at a time, five or six times weekly (with temporary changing of the position of the poles) for a period of two months' time.

Briggs[4] uses two to three milliamperes of strength,

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[1] *Ibidem*, 1892, p. 259.

[2] *Ibidem*, 1894, p. 233, de Gouvea, Rio de Janeiro.

[3] *Ibidem*, 1891, p. 494.

[4] "Therapeutische Monatshefte," 1892, Nr. 1, Hoor, Budapest.

the anode being placed on the closed eyelids and the cathode on the nape of the neck. Concerning the effect of strychnine injections in neuritis, neuro-retinitis, amblyopia, and amaurosis, few favorable reports are to be found in ophthalmic literature.

CHAPTER XVII.

TREATMENT OF DISEASES OF THE MUSCLES AND NERVES.

1. NYSTAGMUS.

This condition occurs in various diseases, such as opacities of the lens and of the capsule. It is also found in zonular and total cataract of children. It is seen in retinal and cerebral disorder, in disease of the ears and in some forms of poisoning (cocaine, santonine, eserine (Michel)). It is found in albinism and microöphthalmus, and occurs as one of the symptoms in the occupation-neurosis of miners. In the last-named disease, it is considered as an exhaustive and fatigue-phenomenon.[1] Some observers, as Pechdo,[2] look upon contamination of the air—for example, by poisonous gas—as the cause.

Treatment is not very successful. In miners, rest and good food are the chief conditions that favor

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[1] "Archiv für Augenheilkunde," 1894, Bd. II, S. 18. Nieden.

[2] *Ibidem*, p. 448.

improvement. In addition, the use of the constant current and strychnine are indicated. Relapses, however, are common, since the causes—overuse of the accommodation with defective illumination—are, as a rule, resumed.

Romié[1] favors the employment of eserine. Nieden (Bochum) recommends the following formula:

225. ℞. Tincturæ strychninæ,[2] . . . . . 15|0 c.c. (f℥ iij, ♏v)
Tincturæ rhei vinosæ,[2]
Tincturæ quininæ compositæ,[2] āā 35|0 c.c. (f℥j, f℥ iiss).
Misce.
SIGNA.—One teaspoonful three times daily.

2. PARALYSES OF THE OCULAR MUSCLES.

Paresis and paralysis of the ocular muscles necessitate medicinal treatment, but before this can be properly and scientifically done, careful study of the text-books concerning the anatomic and physiologic relations—the course, the etiology, the symptoms, the diagnosis, and the prognosis of the conditions—must be made. Only the most important and practical points of this subject can be included here. Abducens, oculomotor and trochlearis paralyses, and multiple palsy alone will be referred to. These conditions are met with in a number of internal diseases, such as tuberculosis, syphilis, diphtheria, diabetes, and hysteria. They are also found in poisoning with monoxide of carbon, in sausage-

[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 546, und 1892, S. 453.

[2] German Pharmacopeia.

poisoning, and in alcohol-intoxication. They may also occur after trauma, and appear as concomitants of diseases of the tissues adjoining the orbit. They are likewise seen in cerebral and spinal diseases, and result from exposure to cold (abducens paralysis). In the diagnosis, it is important to remember that the paralysis affects that eye, the image of which, on testing with the candle-flame, withdraws itself from that of the other eye (Michel). This is an important sign, because, while the limitation of motion is plainly noticeable in paralysis, it may not be found to be so in paresis of the muscles. Indistinct vision, diplopia, erroneous projection, vertigo, and an oblique position of the head, can all be determined. Prognosis is generally not only found in direct association with the cause, but it also depends upon the time at which active treatment is instituted.

Treatment is first of all, causal. If exposure to cold be suspected, sweating, warm baths, and the internal administration of salicylate of sodium or hypodermatic injections of pilocarpine, are all indicated. Later, iodide of potassium should be used.

In order to correct any annoying diplopia, a ground glass should be worn before the affected eye. The patient should carefully avoid all noxious influences, and during inclement seasons, ought to remain in properly ventilated, warm rooms. According to Schweigger,[1] the patient's head should be kept warm

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1 "Handbuch der Augenheilkunde," 1891, S. 132.

with cotton or with cloths placed on the affected side. If the palsy has been sudden, the employment of an emetic may be indicated, this to be followed by derivatives, such as blisters to the neck and tincture of iodine or veratrin ointment to the head and temple.

226. ℞. Veratrini, ... 0|1–0|2 gm. (gr. iss ad iij)
Unguenti glycerini, ... 10|0 gm. (℥iiss).
Misce et fiat unguentum.
SIGNA.—A small mass to be rubbed into the temple.

In recent cases, the artificial leech of Heurteloup has been found of value.

For after-treatment, electricity has been used. In its application, the constant current is employed in such a way that one electrode being situated at the nape of the neck, the other is placed on the closed lid as near as possible to the affected muscle. By this means, a stabile current can be used for about ten minutes at a time every second or third day. The faradic current can be employed in a similar manner. Michel[1] suggests the placing of one pole on the conjunctiva directly over the muscle-tendon. In such a case, of course, an instillation of cocaine must have preceded the employment of the current. He also recommends orthopedic treatment. This is to be performed by seizing the conjunctiva near the sclerocorneal junction, at a point corresponding to the paralyzed muscle, with the fixation-forceps, and drawing the

[1] "Lehrbuch der Augenheilkunde," 1890, S. 575.

eyeball several times, for a minute at a time, in a direction so as to give the weakened muscle-tissues a stretching.

3. ASTHENOPIA.

Of the recognized forms of asthenopia, the conjunctival, retinal (nervous), accommodative, and muscular are the most prominent.

The visual disturbances arise during near-vision. While the patient can see well in the beginning, vision soon becomes indistinct and blurred, compelling him to cease work. Further discomfort, followed by headache, brow-pressure, nausea, etc., all may appear upon his resuming his near-sight. This condition is most common when anomalies of refraction exist. Muscular asthenopia is most prone to appear after exhausting diseases, such as typhoid fever. It is also seen in anemia and chlorosis, and, according to Michel, it is a concomitant of Basedow's disease.

Treatment demands the use of concave lenses in myopia and the employment of convex ones in hypermetropia. Prisms should also be used when necessary. Attention should be paid to the general health, and, in addition to tonics, the constant current may be useful.

Bronner[1] has observed cases of nervous asthenopia that were not dependent upon anomalies of

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[1] "Centralblatt für praktische Augenheilkunde," 1893, S. 566.

refraction, disturbance of the extra-ocular muscles, or disorders of accommodation. The patients were school-children with hereditary taints, or subjects recovering from illness. In some, the condition had followed slight injuries of the eye. Good results were obtained from the use of goggles, strychnine, and the faradic current.

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