

are common in both cases, but different in form or degree. The first should be the mark of the cord. In hanging it will be found not to be horizontal, one side usually being much higher and terminating in something like a point; the mark, furthermore, is invariably higher than in manual strangulation, the weight of the body drawing downward and forcing the cord to the base of the head, while the air passages are closely shut by virtue of the weight of the body or the sudden force of the fall. The marks of the cord are usually deeper and more distinct, and there will rarely be the same evidence of finger marks upon the face and throat. There are more pronounced excoriations in connection with the marks of the cord. The great majority of deaths from hanging are due to the combined causes of asphyxia and apoplexy; while in manual strangulation, perhaps a majority of deaths ensue from asphyxia alone.

One of the most common physical evidences found upon a body when death is attributable to hanging consists of injuries to the ligaments of the spinal column and the tearing of the carotid arteries in the neck.

The lens of the eye is said to be often cracked by the sharp shock of descent, and this sometimes gives help to the expert, if he is prepared to make a proper examination.

The effect upon the genital organs of both the male and the female victim often throws great light upon the question. It is mentioned by the authorities that hanging causes a certain excited condition of these organs both in the male and female, but usually more pronounced in the male. However, evidences of this are not always present, and in view of the fact that often they are found after death from other forms of violence, they alone will not suffice to prove that death was caused by hanging.

The usual effect upon the male genitals is a state of tumefaction; spermatozoa are found in the urine and in the urethra, and frequently there is an emission of semen. In the female, there is often found a dilated and inflamed condition of the genitals, and sometimes a bloody discharge.

Another indication commonly observed is the discharge of the bowels.

As many deaths resulting from hanging are suicidal, it is often a question of grave importance to determine whether the hanging was in fact suicidal or homicidal. It is the unanimous opinion of those who have made profound study of this subject that in the absence of collateral evidence the presumption is that the death was suicidal.

Hanging is such an easy and convenient method of exit from the world that the wretched and despondent frequently adopt it, in ridding themselves of those "ills they have." This is probably due in a certain measure to the fact that unlike many other methods of suicide, hanging, when once begun, can rarely be stopped by the would-be suicide. The first compression of the air passages tends to benumb all sensibilities, to stupefy the will, and to paralyze those other members of the body which, upon a change of mind, would be necessary to effect a self-rescue. Therefore, doubtless, in many instances in which the resolution to destroy one's self is only partially fixed, when the first step has been taken there is rarely an opportunity to go back.

Hanging can be accomplished in so many ways, and with such simple appliances, as also to present a royal road to death to the melancholy and desponding.

The main things to consider in this connection are: the position of the body, whether it swings clear or barely touches the ground; whether the hands and feet are bound; whether or not the cord or other device gives evidence of being prepared by another; and sometimes the manner in which the knot is tied.

There is no doubt also, as a rule, that in suicide there are no marks of violence upon the body, and rarely any evidence that would tend to show struggle.

But, in the end, evidence purely expert and hypothetical, in this as in all methods of determining the cause of injury and death, is to be received with caution,

and is most valuable when considered together with proven facts that point to a cause of the death.

John Bell Keeble.

ASPIDIUM. See *Male Fern*.

ASPIDOSPERMA.—QUEBRACHO. *White Quebracho*. "The bark of *Aspidosperma Quebracho-blanco* Schlechtendahl (fam. *Apocynaceae*)" (U. S. P.).

This plant is not to be confused with the quebracho Colorado (red quebracho), the wood and bark of which are very largely employed for the preparation of an extract used in tanning, and pertaining to the *Quebrachia Morongii* Britton (fam. *Anacardiaceae*). The title "quebracho" means axe-breaker, and is, for obvious reasons, applied to various trees. In the last-named species it is the ironlike wood which has given the name. In that under consideration, it is the great abundance of stone cells in the bark which, occurring in masses, chip out the edge of the axe. The tree is of medium size, widely spreading, evergreen and handsome, and inhabits the northwestern portion of the Argentine Republic and adjacent countries. The supply of bark is irregular, and it is usually scarce and dear. It occurs in irregular chiplike or blocklike pieces, and is about the thickest and roughest bark of commerce, resembling only dita bark in this particular. The gray outer surface is most coarsely and deeply fissured, while the texture is so compact and tough that there is little tendency for it to scale off. Half the thickness or more consists of cork and cortex, the latter filled with large groups of stone cells. The color of this layer may be either of a yellowish white or pale yellow, or more or less rusty or brick red. The inner bark consists of several thick layers of very coarse bast fibres and varies from nearly white to a rather dark brown. It is very compact, tough, hard and woody, and of splintery fracture. All parts of the bark have an intensely bitter taste. The variation in the color of the bark cannot be explained in the present state of our knowledge. It is not the darkening of age, as the writer has bark which has been kept for many years, but which is almost white throughout. It is not improbable that a number of closely related species are in use. If so, the matter is in much need of investigation, as the composition and properties may differ more than the physical characteristics of the bark.

Composition.—Although aspidosperma contains, along with a small amount of tannin, no less than six alkaloids, its action is remarkably simple, owing to the fact that the alkaloids agree rather closely in their general action. *Aspidospermine*, *quebrachine*, *quebrachamine*, and *aspidospermatine* are crystalline, *aspidosamine* and *hydroquebrachine* are not.

Properties.—Their combined action is first to stimulate, then to depress the respiratory centres and to produce a nauseating expectorant effect, followed by muscular depression or weakness, including moderate cardiac depression. Abnormal temperature may be reduced. The drug, used in moderate doses, thus becomes capable of increasing both the number and the depth of the respirations, and of relieving spasmodic conditions, while in large doses it induces convulsive breathing and ends in fatal respiratory paralysis. Vomiting very rarely accompanies the nausea. It is said that aspidosamine, used alone, acts as an emetic. Little has been done therapeutically with the individual alkaloids, that usually sold as aspidospermine being an alkaloidal mixture. Neither has the therapeutical use of quebracho in any form been greatly developed. It is said to be used in its native home partly as an antiperiodic, and partly, like coca, to overcome the dyspnoea of mountain travel. Its chief use in professional medicine is to relieve the dyspnoea of asthma and other spasmodic conditions, as well as of emphysema. Owing to its weakening effect upon the heart, it is contraindicated in case of organic disease of that organ. The results of its continual use have not been found satisfactory, being those of continued depression of the nerve centres, with salivation and nausea.

A peculiar effect has been reported, in some cases, of promptly curing erysipelas by the hypodermic injection into the affected part of a half-grain of commercial aspidospermine. The dose of aspidosperma is 1 to 4 gm. (3 1/4 to 1). There is an official fluid extract, but the extract, in five-grain doses, is more often employed.

H. H. Rusby.

ASPIRATION.—In a paper presented to the French Academy of Medicine, November 2, 1869, Dr. Georges Dieulafoy brought to the notice of the profession a valuable method of detecting the presence of fluids in, as well as of removing them from, various parts of the body. The process is called pneumatic aspiration, or simply aspiration. Briefly stated, it is a method of exploring diseased parts with a hollow needle, connected with a vacuum, or, as it is called by the inventor, a "previous vacuum."

INSTRUMENTS.—While several different patterns of aspirator have been devised and recommended, only two require notice here, as they comprise the principal advantages of each of the others.

The Dieulafoy aspirator (Fig. 364) consists of a glass syringe holding three or four ounces, and having two outlets at its lower end, each of which has a stopcock, *B, B'*; a rubber tube, into which is let a glass index, *E*; and four needles of various sizes. The apparatus is used as follows: The needle having been connected with the syringe by means of the tube, and the outlets closed, the piston is withdrawn to its full extent, and secured by a quarter turn. The needle is now to be introduced at the proper place, and as soon as its point is buried in the tissues the corresponding cock is to be opened, thereby extending the vacuum to the extremity of the instrument. The needle is carefully pushed forward as far as is desirable, or until fluid is found, which will be indicated by its appearance in the index, if not in the syringe. The latter may be emptied by closing its outlet leading to the tube, opening the other, and unlocking and driving the piston home. Another vacuum is to be made as before, and the process may be repeated indefinitely without removing the needle or disconnecting the syringe.

Should the needle become stopped up during the operation efforts may be made to clear it by reversing the action of the syringe, and forcing a little fluid back, or it may be partially withdrawn, or carried a little deeper, or its direction may be changed. These manoeuvres failing, it must be taken out, cleared, and introduced in another place.

With this instrument, stimulating or other liquids may be injected into a cavity by filling the syringe with the fluid, instead of exhausting the air.

Potain's aspirator (Fig. 365) comprises an air pump, *A*, having two openings, *C, D*, each of which is supplied with a metallic valve, working in opposite directions, the former allowing an exit, and the latter an entrance, of air to the pump; a bottle, with a capacity of a pint or more, fitted with a rubber stopper, *B*, which is perforated by a double metallic tube, whose outer portion terminates in two branches, each having a stop-cock, *K, L*; two rubber tubes, with the necessary needles, complete the apparatus.

* Codman & Shurtleff, Boston.

It is made ready for use by connecting the bottle with the needle by the indexed tube, *E*, and with the pump by the tube, *G*. The cock, *K*, nearest the pump, is opened; the other is closed. The air is exhausted from the bottle by a few sharp strokes of the piston, and the cock, *K*, is closed. The puncture is now made, and as soon as the point of the needle is under the skin the corresponding cock, *L*, is to be opened, and the exploration carried to completion. Another vacuum is readily established without disturbing the needle or its connections.

By attaching a rubber tube to the inner end of the metallic one, long enough to reach to the bottom of the bottle, and by changing the tube *G* from *D* to *C*, so as to force air into the bottle, instead of exhausting it, the apparatus may be used for injection or irrigation, or the bottle may be emptied of its contents by simply working the pump. This action is due to the fact that the inner orifice of the tube *K* is on the side just below the stopper, and hence independent of the tube in the bottle.

As a more perfect vacuum can be obtained with Dieulafoy's instrument, it is the best one for diagnostic purposes. It is also well suited for evacuating or injecting small quantities of fluid, especially when it is desirable to be exact as to the amount. But for drawing off large effusions, or for irrigating large cavities, Potain's apparatus saves time and labor. And it may be said that for general use the latter instrument is the more serviceable of the two, as it can be made to do the work satisfactorily in most of the cases requiring this operation.

The peculiar feature of the aspirator, which distinguishes it from the suction trocar, and which makes it so much more valuable, lies in what Dieulafoy calls the "previous vacuum." As this extends to the point of the needle the operator is notified of the presence of fluid the instant it is reached, and therefore there is little danger of passing through a small collection of fluid without knowing it, or of wounding deeper structures unnecessarily, a matter of much importance in tapping joints and other cavities. The strong suction power of

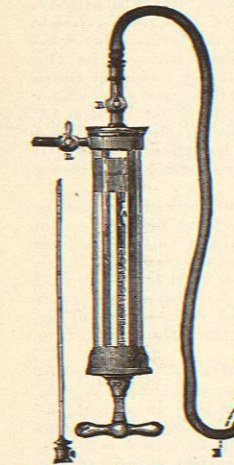


FIG. 364.—The Dieulafoy Aspirator.

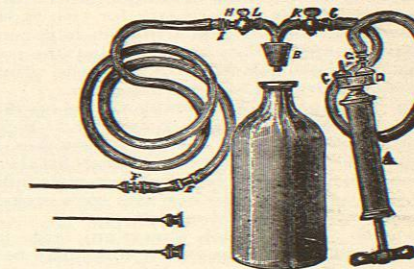


FIG. 365.—Potain's Aspirator.

this instrument enables one to use smaller needles, as well as to evacuate fluids which are too thick to be withdrawn with an ordinary trocar.

The aspirator should always be tested just before it is used upon a patient, because, from its peculiar construction, it is very liable to get out of order. The piston gets loose, the needles are easily plugged with rust or dirt, the tubes crack and break, the cocks stick, the stopper may not fit the bottle. All of these points require attention in order to avoid embarrassment and delay.

It would be well if all aspirator needles were made after the pattern recommended by Dieulafoy, namely, Nos. 1, 2, 3, and 4, having the respective diameters of 0.5, 1, 1.5, and 2 mm. (1/40, 1/16, 1/8, 1/4 inch). After having been used, the needles should be thoroughly cleansed with hot water (carbolicized), dried, and threaded with a wire to keep them patent.

Small trocars can be used with the aspirator in place of the needles for purposes of evacuation and irrigation.

For diagnostic explorations they are inferior to the needles, from the fact that with the former it is impossible to make use of the previous vacuum. The trocars are of special value in tapping the chest, or any other cavity in which there is danger of doing harm by the point of the needle.

In aspirating the cranium, pericardium, spina bifida, and intestine the smallest needle, No. 1, should be used. For the bladder, joints, strangulated hernia, and tumors, No. 2 is suitable; while for abscesses, thoracic and peritoneal effusions, the larger sizes are appropriate.

Owing to the fineness of the needle, and to the elasticity of the tissues, almost any organ or part of the body may be safely explored with the aspirator. For example, the head, chest, stomach, liver, gall bladder, spleen, intestines, uterus, tumors of various descriptions, and aneurisms have been punctured without untoward results. The principal diseases, however, in which the aspirator has been proved by experience to be of especial value are the following:

Retention of Urine.—In the severer stages of this affection, aspiration, as a temporary resource, is often of great service. It is safe, speedy, and effectual. So little pain attends the operation that, as a rule, anaesthetics are not required. If relief is not obtained in these cases from milder measures, together with a moderate trial of the catheter, it is far better to aspirate the bladder above the pubes than to irritate and perhaps lacerate the urethra by prolonged and often fruitless efforts at catheterization. The operation is best performed with Potain's apparatus. It being in readiness, the needle is entered on the median line just above the symphysis, and carried backward and downward toward the hollow of the sacrum, to such a depth that the point will not escape as the bladder contracts. When the viscus is nearly emptied the patient is apt to experience a pricking sensation, which is due to the needle's impinging on the posterior wall. It should be withdrawn a short distance, and the urine allowed to escape as long as it will without producing too much pain. The puncture in the skin may be covered with a bit of adhesive plaster. This operation can be safely repeated as often as may be necessary for two or three days, by which time the urethral irritation is generally so far subdued by appropriate measures that the power of voluntary micturition is restored, and the primary obstruction can receive the required attention.

Aspirating the bladder is preferable to the operation of tapping by the rectum, because it is safer, it is more easily performed, there is less liability to mistakes, and it is not followed by recto-vesical or other fistulae, by extravasation of urine, or by pelvic or prostatic inflammation and suppuration, accidents which have occasionally supervened upon the rectal operation.

Affections of the Joints.—While almost any large joint containing a considerable quantity of fluid may be aspirated, the operation is chiefly confined to the knee. Large effusions in that articulation, whether of serum, blood, or pus, can be safely and quickly removed by this method. The needle is to be inserted wherever the swelling is most prominent, which is usually above or to the inside of the patella. Care should be taken not to wound the cartilages with the point of the instrument, as serious results have been known to ensue. After the operation the patient should be kept in bed, the limb should be placed upon a posterior splint, and firm pressure should be applied by means of flannel or rubber bandages. Should the fluid reaccumulate the operation may be safely repeated (under aseptic precautions) as often as is necessary. Anaesthetics are required only in children, and in nervous or timid subjects.

Strangulated Hernia.—It was thought at one time that aspiration might prove to be very beneficial in the treatment of this affection, but it has not stood the test of experience. The needle is apt to become clogged, or from various causes the tumor cannot be sufficiently reduced by this means to enable it to be returned to its proper place. It is true that many cases of successful reduction of the hernia after aspiration have been reported from

time to time, but as the operation oftener fails than succeeds it is less frequently resorted to at present than it was formerly. Fatal results have followed this procedure, yet, when carefully performed with a No. 2 needle, it is attended with little danger, and it is occasionally successful.

Abscess.—Aspiration is frequently of the greatest value in determining the presence and character of fluids, but as a method of treating ordinary abscesses it is far inferior to free incisions, drainage tubes, and antiseptics. The pus usually reaccumulates after each evacuation, until finally a spontaneous opening takes place, unless it is anticipated by an artificial one. Occasionally, however, a favorable result follows repeated aspirations, as occurred in the case of an extensive pyæmic abscess over the sacrum, in the practice of a colleague. It was aspirated twenty-one times in twenty-five days, twenty ounces of pus being withdrawn at the first operation, and three ounces of serum at the last. But such cases are probably best treated by the method of incision, as above mentioned. An exception to this rule is an abscess occurring in a person the subject of the hemorrhagic diathesis. Such cases, when active interference is necessary, should be aspirated rather than incised, as the hemorrhage would be less, and probably could be more easily controlled. Hepatic, perinephritic, and some other deep collections of pus may occasionally be treated by repeated aspirations. The diagnosis is thus rendered certain, the shock of the operation is less than that which follows incision, and in a certain proportion of cases a favorable result will be obtained.

Hæmatoma.—Collections of blood in the cellular tissue resulting from contusion or other injury may often be satisfactorily treated by aspiration, one or two operations being sufficient in many cases to effect a cure. A large needle or trocar may be used to evacuate the contents, and firm pressure should be applied to prevent a return of the affection. The withdrawal of effused blood by this method is much more successful than the evacuation of pus, and seldom does harm.

Pleuritic effusions can be readily drawn off with Potain's aspirator. It is better to use a trocar than a needle in these cases, as by so doing there is less danger of injuring the lung. The puncture may be made in the eighth or ninth intercostal space, about two inches below the angle of the scapula. The operation should cease the instant pain or coughing sets in, but it may be repeated as often as necessary. Should the fluid reaccumulate less rapidly after each evacuation, and the general health improve or at least remain good, a favorable result may be expected by persisting in the treatment.

It is the opinion of many who have had a large experience with this operation, that ether should seldom, if ever, be given during its performance. A number of fatalities have resulted from this practice. The pain is neither severe nor of long duration. Children may be restrained by moderate force, and adults seldom request an anaesthetic if the danger is explained to them. Should it be thought necessary to administer ether, a few whiffs, just enough to produce primary anaesthesia, is sufficient, and is much safer than complete etherization. But the rule should be, use no anaesthetics in tapping the chest.

The **pericardium** may be safely aspirated with the smallest needle, as follows: The puncture is to be made in the fourth intercostal space, one inch (2.5 cm.) from the left border of the sternum, and the instrument carried slowly backward, upward, and a little toward the median line. The puncture may also be made in the fifth interspace, an inch and a half to the left of the sternum. To avoid wounding the heart it is important that the vacuum should extend throughout the needle at the earliest moment possible. Little danger need be apprehended, even if that organ is touched with the needle. The latter should immediately be withdrawn under these circumstances and introduced in another place. Aspirating the pericardium is an operation that will not often be required.

Should it be deemed advisable to evacuate the fluid in

a case of **hydrocephalus**, it may be done with the smallest needle. The puncture should be made through the anterior fontanelle, far enough from the median line to avoid the longitudinal sinus. Experience gives slight encouragement for the performance of this operation.

Spina bifida has been cured by aspiration, either alone or followed by some stimulating injection. The smallest needle should be used, and pressure immediately applied.

Tumors may often be advantageously aspirated to determine their character or contents, but it is seldom that the operation is of any curative value. The most notable exception is probably that of a cyst of the broad ligament, cases of which have been cured by one aspiration.

Tympanites can be temporarily relieved by aspirating the intestines with a fine needle, but the method probably has no advantages over simple tapping, and, moreover, it is not entirely free from danger, as extravasation of feces has followed and caused a fatal termination.

The principal dangers to be apprehended in performing aspiration are the wounding of large veins, arteries being seldom injured in this manner, extravasation of feces and suppurative arthritis, as mentioned above, and peritonitis from tapping the abdomen. In conclusion it may be said that while aspiration is generally safe, yet, like every other operation, it should always be carefully performed, and with a full understanding of the possible accidents and results.

George W. Gay.

ASPIRIN.—Acetyl salicylic acid, C₉H₇OCO.CH₃.CO-OH, is prepared by acting upon salicylic acid with acetic anhydride. It crystallizes in white needles, which are soluble in about one hundred parts of water, and practically insoluble in acids. Alkaline fluids dissolve it freely, but split it up into its components.

Aspirin is a recently introduced remedy which has been used with good success in acute rheumatism. Being insoluble in the gastric juice it passes unchanged into the duodenum, and there, in the alkaline fluids of the intestine, it is broken up to form salicylates and acetates. Over sodium salicylate it possesses the advantages of not deranging the stomach and not causing cardiac depression, nervous symptoms, tinnitus aurium, deafness, etc. Aspirin may therefore be used in large dose even in cases of cardiac disease. The usual dose is ten to twenty grains two or three times a day, increased in the resistant cases to every two hours. It is administered in capsule, or suspended in syrup, or in a mixture with syrup and gaultheria water.

W. A. Bastedo.

ASSIMILATION. See *Metabolism*.

ASTEROL.—Para-sulpho-phenol mercury and ammonium tartrate—C₁₂H₁₀O₂S₂Hg.4C₄H₄O₆(NH₄)₂.8H₂O. This is a preparation claimed by its manufacturers to contain fifteen per cent. of mercury, to have less action on metals than other mercury compounds, and to precipitate albumin to only a small degree. Steinmann's investigations have sustained these claims, and he states that one to ten per cent. solutions of albumin are precipitated by 0.1-per-cent. solution of mercuric chloride, while they are made only slightly opalescent by a solution of asterol of the same strength. Vertun has questioned the claims of the manufacturers, stating that he found only eleven per cent. of mercury, and that it would attack surgical instruments and precipitate albumin. Asterol is a brown powder, slowly soluble in cold water, and rapidly soluble in hot water with the formation of a permanent solution. It is used as an antiseptic substitute for mercuric chloride in 0.1 to four per cent. aqueous solution. Such a solution of 0.7-per-cent. strength is equivalent in antiseptic power to a 0.1-per-cent. solution of mercuric chloride.

W. A. Bastedo.

ASTHENOPIA (from *ἀσθενής*, weak, and *ὄψις*, eye) is the name proposed by Mackenzie (1843) to designate a complex of symptoms constituting so-called *weakness of sight*.

"By asthenopia is understood that state of vision in which the eyes are unable to sustain continued exercise upon near objects, although the patient, upon first viewing such objects, generally sees them distinctly, can employ his sight for any length of time in viewing distant objects, and presents no external appearance of disease in his eyes. . . . In the open air the patient makes no complaint, being able to discern distant objects clearly and without fatigue. . . . In reading, sewing, and the like, he is obliged, partly from the confusion which seems to spread over the objects, partly from a feeling of fatigue in the eyes, to interrupt the exertion. . . . A very short period of rest is, in general, sufficient to recruit the sight, so that the power of perceiving small objects returns and the patient is in a condition to resume his employment. . . . When near objects fade away, as it were, from the asthenopic sight, some patients feel it a sufficient relief to turn their attention to remote objects, which they continue to see perfectly; others find remote objects also to appear confused, and require to shade their eyes till the attack wears off. The most complete relief is in all cases obtained by shutting the eyes. . . . Asthenopia is rarely observed to commence in those who have already reached the middle period of life, but almost exclusively takes its origin in childhood or youth. . . . Few patients, not even those who are mere children, continue to be long affected with asthenopia without making use of convex glasses. . . . A child, engaged in learning its lesson, complains that it cannot see, and repeats the complaint so frequently, especially by candle-light, that his father or grandfather at last says, 'Try my glasses.' The child now sees perfectly, and night after night the loan of the glasses is required before the task can be finished." To complete this graphic sketch, by Mackenzie, it is only necessary to add that, as a rule, the asthenope sees perfectly at a distance with the same convex glasses which make it easy for him to read, and that he needs only to wear convex glasses, of the greatest strength compatible with distinct vision at a distance, to be at once and completely relieved of his disability.

No allusion to asthenopia is to be found in the medical writings of antiquity. Taylor (1766) sketches its symptoms in a few lines under the name "debilitas visus." Scarpa (1801) mentions it as one of several forms of "incomplete amaurosis," and says of it that it is, "properly speaking, not so much an amaurosis as a weakness of sight from fatigue of the nerves, and especially of those which constitute the immediate organ of vision," i.e., of the optic nerve and retina. Several later writers on the diseases of the eye have given excellent descriptions of asthenopia, but always in connection with amblyopia or amaurosis, of which it was assumed to be an early stage and, therefore, a precursor of blindness. Gradually stress came to be laid upon fatigue as the essential symptom, but as the seat of the fatigue was still thought to be in the retina, it was supposed that, if neglected, it might develop into amaurosis and end in loss of sight. Next, it was shown that asthenopia, even of many years' duration, does not result in actual impairment of vision, and so it came to be regarded as a condition of "morbid sensibility of the retina," or else as an amblyopia of a special and benignant type. Later, the fact began to be recognized that the essential phenomena of asthenopia are such as to suggest muscular fatigue, and the explanation was sought in weakness, or in overextension, of one or more of the external muscles of the eyeball. Still later, with a growing belief in the existence of a true accommodative adjustment, asthenopia was thought to be the result of weakness of this function, and so was brought into connection with so-called presbyopic vision in young persons. Finally, through the discovery of the mechanism of accommodation, and the demonstration of hypermetropia as an error of refraction, the way was opened for the recognition of the true cause of asthenopia in an overloading of the accommodation incident to the displacement of the region of accommodation in hypermetropia. Asthenopia is, therefore, not properly a dis-