comes putrid and fetid, giving to the patient and his surroundings an odor that is persistent and offensive. Repeated attacks of epistaxis occur. Tinnitus and impaired hearing and earache are often complained of. As the growth extends into the accessory sinuses, the orbital and cranial cavities, a new set of symptoms develops. The cheek becomes full, the eyeball is pushed out, vision may become impaired, pain is greatly increased, and finally signs of meningitis or brain abscess develop.

Objectively, epithelioma presents itself early in the disease as an infiltration of the mucous membrane, suggesting a papillomatous hypertrophy, but ulceration soon takes place, leaving the edges of the ulcer hard and the surface angry and covered with a thick, grayish secretion. Bleeding follows the slightest probing. The tumor shows marked tendency to invade the deeper parts, with little inclination to extend outward to the skin. Sooner or later the submaxillary and cervical glands become involved, though this is not always so, and cachexia develops only after the disease has existed for some time. The differential diagnosis is to be made usually from syphilis, lupus, and tuberculosis. Antisyphilitic treatment will often clear up a suspected epithelioma, and when any doubt exists the iodides should be given, if but for diagnostic purposes. Lupus has a very marked tendency to extend to the skin, which is usually involved. In a case of suspected primary tuberculosis, the bacillus will be found if that disease is present. The microscope may be required to determine the diagnosis of epithelioma; in employing it, however, one must not overlook the possibility that the removal of a piece of the tumor may be followed by renewed activity of the growth.

The *prognosis* is absolutely bad, few if any authentic cases of recovery having been reported. The disease appears to be more rapidly fatal in the nose than in most other parts of the body. Treatment heretofore has been unavailing; operation seemingly not only not eradicating the disease, but not affording even temporary relief. The growth recurs rapidly. While the *x*-ray as a curative or remedial agent in the treatment of cancer is still experimental, yet the very favorable reports of its use in other parts of the body would make it seem that the patient should be given whatever benefit there may be in this treatment. Pain may be relieved somewhat by orthoform or other local anæsthetic, and toward the end narcotics should be given to relieve the sufferer, and antiseptic washes used locally throughout the disease.

Thomas H. Halsted.

NASAL CAVITIES, DISEASES OF: PARASITES.—The presence of animal parasites within the nasal cavities is of relatively infrequent occurrence. In the majority of cases such an event is purely accidental; true parasitic infection—*i.e.*, the presence of animal forms which reproduce, or pass one or more stages of their existence, within the nose—is very rare. As is the case with the external auditory canal, the nasal orifices, under certain conditions, may form favorable avenues of entrance for such creeping forms of animal life as are fond of escaping the light by crawling into dark places. The residence of such animals within the nose is usually but temporary; during this time they do not draw nourishment from the body tissues. The effects produced are chiefly those of local irritation or obstruction. To this condition the term pseudoparasitism may with propriety be applied.

Pseudoparasitism.—Among such pseudoparasites of the nasal cavities may be mentioned earwigs, centipedes, numerous beetles, insects, spiders, mites, bedbugs, leeches, and worms. Entrance into the nose is usually obtained during sleep, very often in the open air, during the daytime. The local symptoms of irritation and obstruction may be very slight or severe. Bloody or mucopurulent discharges may be produced. In many cases the chief symptoms are of a nervous character, due to fright or worry. The intruder may penetrate into the frontal sinuses. Such cases may be attended by dangerous symptoms or even result fatally. It is said that centipedes are especially likely to reach the frontal sinuses. Cases are reported of these animals remaining in the frontal sinus for years, drawing their nourishment from the secretions of the cavities.

The occasional entrance of round worms (*Ascaris lumbricoides*) into the upper air passages and into the nasal cavities is of clinical importance. As is well known, these worms may, during the sleep of the affected individual, wander from the intestine, through the stomach and œsophagus, into the mouth and upper air passages. Ordinarily no especial symptoms are produced, but the passage of the worm into the larynx may cause serious symptoms of suffocation or even result fatally. Important obstructive symptoms may also arise from the penetration of the worm into the Eustachian tube or tear duct.

The *Oxyuris vermicularis* may be transferred from the anus to the nose through uncleanly habits, but does not remain in the new location.

True Parasites.—*Protozoa.*—Various forms of protozoa (*Amœba*, *Cercomonas*, and *Trichomonas*) have been reported as occurring in the nose, in such conditions as ozæna, purulent catarrh, whooping-cough, noma, etc. It is very doubtful if any of the appearances, described in the majority of such cases, were really protozoa; it is much more likely that they represented degenerating cells, leucocytes, etc. More careful observations are needed to settle this point.

Worms.—The accidental presence in the nose of *Ascaris* and *Oxyuris* has already been mentioned. I have been unable to find in the literature any well-authenticated case of *Cysticercus* of the nasal cavities. Only two or three cases of nasal *Echinococcus* have been reported. In one of these, observed by Rogers, the patient, a woman aged thirty-four years, had had a severe nasal obstruction for two and a half years. During a violent effort to clear the nose there was an escape of a large quantity of clear, straw-colored fluid. Two months later a cyst-like body was removed by snare from the middle turbinate; this was ruptured during removal. The microscopical examination showed the presence of numerous echinococcus hooklets in the walls of the cyst.

Arachnida.—Pentastoma denticulatum, the larval form of *Pentastoma tænioides*, is found in the nasal, frontal, and maxillary sinuses of various animals, particularly in the dog. Rarely, the parasite may be found in the human nose; the infection usually takes place from dogs, or through the accidental inhalation of the young larvæ, or by the eating of contaminated food. In the latter case the parasite later wanders from the alimentary tract into the nasal cavity. Its presence there causes inflammation, nosebleed, etc. The diagnosis rests upon the occurrence of severe irritation, and the demonstration of the parasite.

Insects.—The most common and important nasal parasite belonging to this class is the maggot or larva of certain flies, both of the biting and the stinging varieties. The fly lays its eggs upon either the normal or diseased mucous membrane of the nose; in the latter case probably attracted by the odor of secretions. Certain varieties may force their way into the healthy nose and there deposit their eggs. Such an infection occurs, in the great majority of cases, when the affected individual falls asleep in the open air during the daytime. The *Sarcophaga carnaria, Sarcophaga Wohlfahrtii, Musca anthropophaga, Musca cadaverina, Musca domestica, Musca stabulans, Piophila casei, Lucilia macellaria, Œstrus bovis*, etc., have been reported as producing maggots within the human nose. In certain tropical countries, Mexico, Central America, the tropical portions of South America, West Indies, Hindustan, etc., such infections are not uncommon. The condition is known as *Myiasis narium*. In the great majority of cases the affected individuals have a history of ozæna or purulent nasal catarrh. The *Lucilia macellaria*, however, frequently attacks the healthy nose.

The symptoms of myiasis are usually very severe; it is said that the sufferings may be so intense as to lead to suicide. The number of eggs laid upon the nasal mucosa

may be very great, as many as five hundred eggs of *Lucilia macellaria* (Texas screw-worm) having been removed at one time. In other cases several hundred larvæ may be removed or discharged. The eggs hatch rapidly, and nasal obstruction soon results, with intense pain in forehead, cheeks, etc. A watery or bloody discharge, œdema of the neck and face, vertigo, sleeplessness, delirium, coma, reflex vomiting, and convulsions mark the affection. Fever may or may not be present. The nasal mucosa may be completely destroyed and the bones denuded through the efforts of the growing larvæ to obtain nourishment. Within a short time, one to two weeks, the larvæ leave the nose to form their cocoons outside. The character of the nasal discharges usually changes after the maggots have left the nose, becoming more purulent. The inflammation may persist for a long time, or in other cases the symptoms may abate immediately upon the removal of the parasites.

The history of the case, the symptoms of rapid obstruction with watery or bloody discharge, and the demonstration of the presence of the maggot make the diagnosis clear. The prognosis is on the whole favorable, but fatal cases may occur.

The treatment of nasal parasites in general consists, first, in the removal of the parasite; secondly, in the treatment of the local condition caused by its presence. In the case of maggots or other parasites which are more or less firmly attached to the mucosa, various antiseptics may be used for the purpose of stupefying or killing the parasite. Inhalation of chloroform, ether, turpentine, bichloride solutions, calomel powder, decoctions of tobacco, balsam of Peru, are among the remedies suggested. The filling of the nasal cavities with warm glymol is advised, especially in the case of maggots; the oil filling up the spiracles of the larvæ kills them, and they are then easily washed out. In very rare cases it may be found necessary to explore the frontal sinus.

Aldred Scott Warthin.

NASAL CAVITIES, DISEASES OF: RHINOSCLEROMA.—On account of the wide diffusion of the lesions it has been suggested to substitute the name scleroma, without a local qualification, for this affection. It is a rare disease which is seldom found excepting in Austria, Hungary, and Italy. It is characterized by a peculiar connective-tissue growth in the mucous and submucous tissues of the respiratory tract which forms nodes, tuberosities, or slightly raised, smooth, flat, and extremely hard patches. In course of time these are seen about the nostrils or upper lip, and finally they invade any and every portion of the respiratory tract. These new growths are of a cartilaginous hardness, and owing to the atrophy of the new tissue, they form dense cicatrices without the intervention of ulceration.

Anatomical Characteristics and Course of the Disease.—Hard prominences, varying usually in size from a millet seed to a pea, and diffuse infiltrations characterize the disease. The affection usually begins in the salpingo-palatal fold or in the choanæ, and gradually progresses forward until the vestibule of the nose is reached, where it may terminate, or it may involve the external integument, occasionally invading the upper lip and changing it into a hard, snout-like protuberance. It also extends downward involving the pharynx, larynx, trachea, and bronchial tubes which become constricted by the contracting cicatrices. The diffuse infiltrations are firm and very rigid, and in proportion to their size mechanically obstruct the nares. Later, they undergo cicatricial transformation, and further obstruct or completely obliterate the nasal passages by the contraction of the resulting scars. When the cartilaginous external nose is involved in the disease, it becomes deformed by nodular protuberances of intense hardness. The integument of the nose is at first dense and white; later it reddens or acquires a livid hue. Occasionally slight ulceration occurs and fissures sometimes form, especially between the alæ and the cheek. In the nasal vestibule the disease often forms voluminous folds, which may protrude from the nostril. These are of a bluish-red color and are sometimes a centimetre in thickness.

Etiology.—Among those who have given this affection the most study it is generally believed to result from the presence of the Frisch bacterium, which is always

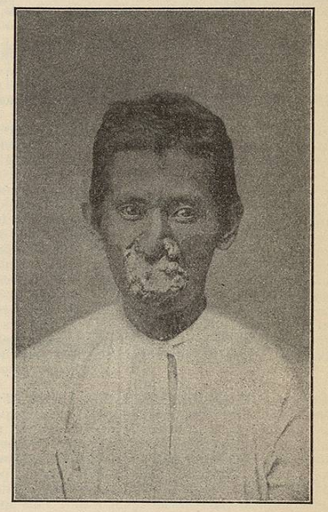

Fig. 3491.—Rhinoscleroma. (From Le Dentu et Delbet's "Traité de Chirurgie.")

found in considerable numbers in the cells in the lymphatic spaces of the affected part. There is no proof that it is contagious.

Symptomatology.—In the beginning the disease is marked by symptoms of simple chronic rhinitis, which may extend over a period of several years. The secretion, at first watery, gradually becomes purulent. Afterward it dries into scabs or crusts, which as they decompose emit a very offensive odor, different from that of ordinary ozæna and apparently peculiar to rhinoscleroma. The scleromatous tissue is not usually deposited until the catarrhal symptoms have existed for several years. On account of the painlessness of the disease and its gradual accession, patients commonly do not present themselves for treatment until a number of years after its beginning.

Diagnosis.—Rhinoscleroma is to be distinguished from syphilis, epithelioma, and keloid, though as the latter is distinctly a disease of the skin which often appears in old cicatrices, it is not at all likely to be confounded with rhinoscleroma. The essential features in the diagnosis are the chronic course of the disease, the cartilaginous hardness of the infiltration, the formation of cicatrices without previous ulceration, the invasion—during the latter portion of the disease—of the larynx, trachea, or pharynx, and the broadening and deformity of the external nose by the scleromatous deposit.

Syphilis in the tertiary stage also leads to cicatrices which might be mistaken for those of rhinoscleroma, but syphilitic lesions differ from those of the disease under consideration in that their progress is more rapid and the hardness of the gummy deposits less marked. The syphilitic nodule also commonly ulcerates, whereas the scleromatous one does not. Again, the specific treatment of syphilis is usually followed by speedy improvement,

whereas the iodides and mercurials do not affect the progress of scleroma.

Epithelioma causes induration and some nodular infiltration of the skin, but the nodules are softer than those of rhinoscleroma and they soon ulcerate and bleed. The disease also runs a much more rapid course than the one under consideration.

Prognosis.—This affection commonly extends over many years. There is no tendency to spontaneous recovery, and unfortunately treatment is unavailing except in the way of palliation. In consequence of the tendency to cicatricial contraction, when the affection involves the larynx, the trachea, or bronchial tubes, it may prove fatal by obstruction to respiration, but it does not usually shorten life.

Treatment.—The treatment is entirely operative and palliative. Obstructive infiltrations may be removed and thus relief be obtained for several years, though it is impossible to prevent recurrence and extension to other parts. Even extensive radical operations in the beginning have no influence in preventing the progress of the disease. In the operative measures outgrowths in the nose may often be removed by the snare, but the harder tissues must be cut away with a scalpel or trephine, or removed with a sharp spoon, and the operation may be finished with a galvanocautery, or hardened nodules may be reduced by electrolysis. The wounds left by these operations readily heal. It is generally thought best not to interfere with facial deformities, as recurrence is practically certain and excision would only necessitate repeated plastic operations to cover the defects resulting.

E. Fletcher Ingals.

NASAL CAVITIES, DISEASES OF: SINUS AFFECTIONS.—The antrums of Highmore are irregularly shaped cavities situated in the head between the upper teeth and the orbital cavities. They vary in their dimensions, the horizontal and antero-posterior diameters averaging about 25 mm. There is one normal opening in each sinus—the hiatus semilunaris—which is situated in the uppermost part of the inner wall. This opening frequently becomes occluded by inflammatory processes, and an artificial opening is then created by the internal wall rupturing at a point posterior and inferior to the normal aperture. Occasionally the roots of the molar teeth project upward and form small pyramids on the floors of the sinuses. Semicircular membranes, bands, and bony partitions, one-fourth to one-half inch high, are frequently found dividing the lower and lateral portions of the cavities into compartments.

The walls of the canine fossæ and the inner or nasal walls, beginning at a point about one-third of an inch above the floor, are very thin, excepting those parts which give attachment to the middle turbinate bones. The inner lip of the hiatus semilunaris forms a small canal which connects with the mouth of the infundibulum or naso-frontal canal; a frequent result of this being that the fluids from the frontal sinus and anterior ethmoid cells flow down into the antrum of Highmore. The principal physiological function of the nasal accessory cavities is to supply fluid secretion and warm air to the nose and to serve as resonance chambers within the head. During inspiration the apertures, including the naso-lachrymal ducts, have a tendency to open, while during expiration they partially close; at the beginning of inspiration the partial vacuum produced takes a part of the latent air from within the cells, and the velocity of the inspired current further draws from them. Toward the end of the inspiratory act new air enters the cells to fill the partial vacuum, this entrance being aided by the natural law by which warm air is displaced by cold; on expiration the *vis-a-tergo* pressure partially closes the cells. These to-and-fro currents of air constantly draw the tenacious mucus from the cells, overcoming the adverse conditions of small openings and the law of gravity.

There are four groups of sinuses which communicate with the nasal cavities, viz., the frontal, the maxillary, the ethmoidal, and the sphenoidal. As the diseases of the frontal sinuses have already been fully discussed in Vol. IV., under the heading *Frontal Sinuses, etc.*, the present writer will consider only the affections which involve the other three groups of sinuses.

I. Diseases of the Maxillary Sinuses.

Etiology.—Much has been done of late to solve the problems as to the cause of diseased conditions within the antrum of Highmore. Distinguished writers differ considerably concerning the relative frequency of different morbific agencies as causative factors. Careful observers are proving that acute infectious diseases are responsible in many cases that were formerly attributed to other causes, and this is in accord with my own investigations.

The teeth are responsible for nearly one-half of the seriously diseased cases that have come under my observation. A careful examination of the teeth extracted in a series of cases gave abundant evidence of alveolar periosteitis, caries, and necrosis at the root end. In other cases the maxillary bone was necrotic, carious, and destroyed to a variable extent. Œdema of the nasal mucosa and polypoid changes existed as definite causal factors in a large proportion of the cases of nasal origin. More or less pressure upon the middle turbinal by a deviated and thickened septum, this in turn pressing upon the ostium maxillare, approximately closing the hiatus and causing retention of secretions more or less laden with pathogenic bacteria, was a prominent factor in many cases of chronic muco-purulent discharge from the antrum.

I am convinced that the suppurative rhinitis of childhood often leaves a local suppuration in the antrum which continues generally through adult life, unless proper surgical procedures are employed to relieve it. Syphilis, tuberculosis, tumors, and foreign bodies occasionally cause suppuration of the antrum.

Symptoms.—Empyema with complete occlusion gives rise to extremely painful conditions, and there is a feeling as though the antrum would rupture from the intense pressure. These symptoms disappear immediately after a vent is secured. In those cases in which the acute and subacute catarrhal processes occur in the nasal cavity and extend into the antrum by continuity, there are a slight fulness and a sensation of stuffiness in the region beneath the eye, associated with a thick muco-purulent discharge into the middle meatus beneath the bulla ethmoidalis.

Complete convalescence in these cases takes place within from three to six weeks. Postnasal catarrh is a constant symptom. In the chronic cases mucus and pus are discharged through the anterior nares. Most patients who have very thin fluid in the antrum complain of it running down over the upper lip whenever the head is inclined forward.

Asthma, tubal stenosis, and tinnitus aurium, impairment of hearing, mental lassitude, and inability to concentrate the attention for any length of time are all common symptoms. Pain is a most irregular symptom; it is absent at times even in the most severe cases. It is often localized in the temporal or the occipital region. The most constant symptom is more or less discharge of muco-pus over the lower posterior part of the lip of the hiatus semilunaris.

Pathology.—A classification which I made several years ago of the pathological conditions practically holds good to-day. In this there were eight subdivisions, as follows: I. Acute, catarrhal, suppurative, and infectious sinusitis without complete stenosis of the normal outlet. II. Acute catarrhal, suppurative, and infectious sinusitis with complete occlusion of the normal outlet. III. Subacute and chronic catarrhal and suppurative sinusitis with moderately obstructed opening, with or without decomposing puro-mucoid débris. IV. Polypoid degeneration. V. Alveolar periostitis and periodontitis attended by suppurative caries, necrosis, or other pathological changes

at the root end. VI. Atrophic rhinitis. VII. Tumors and foreign bodies. VIII. Syphilis.

The cases of the first class are very common. The disease is usually self-limited and frequently leaves the mucous membrane much swollen and hyperplastic. Occasionally associated with an acute infectious disease there is a necrosis of the antral mucosa as well as of other parts of the mucous membrane of the respiratory tract. When there is complete stenosis, and when neither nature nor the surgeon relieves the condition, the consequent tension causes necrosis of the soft tissues, and this occasionally extends to the bone. In the subacute and chronic catarrhal suppurative cases, when the opening is moderately obstructed, the muco-purulent secretion frequently becomes partially inspissated, forms an accretion, and acts as a foreign body, causing the destruction of tissue. These by-products frequently destroy the surface of the mucosa and start small ulcerated areas which, if not cured, extend in time to the periosteum and often to the bone itself. Polypoid and œdematous changes which involve the ethmoid often have their origin in the antral membrane. If they occur on the lateral or upper walls of the cavity and remain more or less flat or mammillated, there is a possibility that the mucous membrane at these points will, under favorable circumstances, return to its normal state. But if these growths once become pedunculated it seems to be impossible for them to return to the condition of a normal mucous membrane. Caries, necrosis, and periosteitis in the molar or bicuspid roots frequently extend through the bony floor of the antrum and give rise to fistulæ, the discharge from which pushes up the periosteal lining of the cavity, and often leaves it floating in a muco-purulent medium. Ruptures may take place through this membrane at different points, causing a discharge of secretion into the antrum. The antral membrane becomes very thick and granular, and the mucosa and bony wall of the cavity degenerate. The atrophic process, which is the consequence of suppurative rhinitis in early childhood, invades the antrum, frequently destroys the epithelium and the glandular structures of the mucous membrane, and leaves a sclerosed membrane which secretes a semipurulent matter; this decomposes in the warm air of the antrum and issues through the normal opening into the nose, where it is formed into crusts by the inspired air.

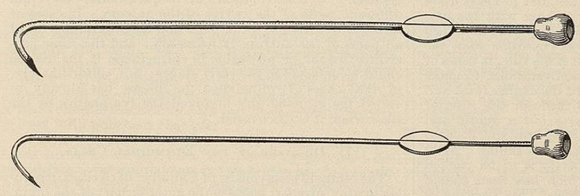

Fig. 3492.—Cannula Needle for Aspirating and Irrigating the Antrum of Highmore through the Wall of the Middle Meatus.

Tumors, especially the syphilitic gumma and the epithelioma, may form in the antrum.

Diagnosis.—A discharge of pus from one nasal cavity is by far the most suspicious individual symptom of empyema of the maxillary sinus. It is the writer's custom in all cases of nasal and rhinolaryngeal disease to make a complete investigation of the condition of the nasal cavities and the rhinopharynx, and then to account for the condition of the accessory sinuses as far as modern methods will allow. When a disease of one of the sinuses is associated with a discharge, cocaine and adrenalin are carefully applied throughout the middle and inferior meatuses. After the shrinkage of the mucosa has taken place a soft silver probe is used in the region of the ostium maxillare. The patient's head is

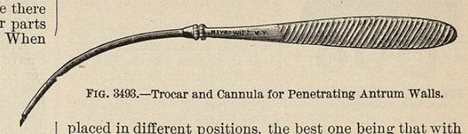

Fig. 3493.—Trocar and Cannula for Penetrating Antrum Walls.

placed in different positions, the best one being that with the top of the head on the floor, the patient lying across a chair. When this position is assumed, and especially when the patient at the same time forcibly blows his nose, the secretion within the antrum will generally be forced to flow over the lip of the hiatus beneath the bulla ethmoidalis.

In making the test by transillumination, I usually employ a four-candle power electric lamp of moderate brilliancy, the patient being in a dark room, and the lamp, attached to a suitable holder, being held within the closed cavity of the mouth. I do not rely entirely, however, upon the electric lamp, but use it only as an indicator for further efforts at determining the condition within the maxillary cavity. If there is a unilateral umbra, warranting the suspicion that the antrum of that side is diseased, the investigation must be pushed in other ways until the condition of the antrum is ascertained. Frequently after a curved irrigator has been passed through the normal opening, and more or less forced irrigation employed, definite evidence of a suppurative process is obtained. If this procedure cannot be accomplished, puncture should be made with a curved trocar through the antral wall near the unciform process, at a point situated posteriorly and inferiorly to the hiatus. In other cases it may be necessary to pass a trocar through the wall of the inferior meatus, when, under forced irrigation, some of the retained secretion or débris will be expelled through the natural opening. In certain cases of cystic tumors I have found it necessary to make an exploratory opening through the canine fossæ before the diagnosis could be definitely settled.

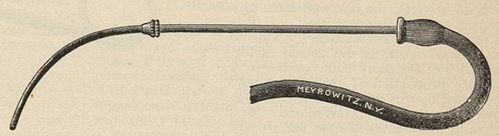

Fig. 3494.—Rubber and Metal Attachment for Central Cannula.

Prognosis.—The prognosis of diseases of the maxillary sinus will depend upon the pathological conditions present in each individual case. The ordinary cases of empyema are extremely annoying and affect the general health in many ways;—constant swallowing of the fetid pus is one of the most objectionable features.

The diseases of these sinuses are not nearly so fatal as those of the other sinuses on account of their distance from the cranial cavity. Even malignant tumors are more curable here. In empyema cases the prognosis depends upon the manner, method, and extent of the surgical procedure. If sufficient drainage can be secured, either into

the mouth or into the nose, and if careful curettage of the antrum be employed, the drainage and ventilation being maintained until nature's process restores approximately the mucosa, the prognosis can be said to be fairly favorable.

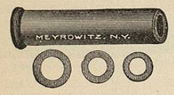

FIG. 3495.—Headed Rubber Antrum Tubes.

In all infectious cases the prognosis is favorable if complete irrigation can be carried out through the normal opening.

TREATMENT.—In considering the best treatment for the individual cases, one must ascertain, through every known method, the exact pathological conditions. It must be borne in mind, however, that while some of the apparently worst forms of antral empyema have been cured by the extraction of a tooth and a few weeks' irrigation through the socket, there are other cases of apparently a much less serious character, which resist all our therapeutic efforts in the most stubborn manner. Thus, for example, the writer has seen cases of trivial discharge (the only symptoms being a moderate post-nasal catarrh), which, after a thoroughly radical operation, have terminated in the most obstinate purulent condition. Since we cannot obliterate the antrum without objectionable results, we must try to restore its functions without destroying too much of the lining membrane.

The author believes that he was the first to insist upon not treating the antrum in full accordance with the prevailing surgical teachings. It is his belief that thorough curettage frequently induces a worse condition than the disease for which it is employed. It is his rule, in cases of long history and severe disease manifestations, to make large openings through the region of the canine fossa and malar ridge and counter-openings through the inferior or middle meatus, and then to carry out a gentle and careful curettage of the mucosa and a firm and decided curettage of whatever bare bone may be found. After these steps have been taken the cavity is to be packed with aristol or iodoform gauze which has been passed through mercuric-bichloride solution. This packing is never allowed to remain longer than a week. At the expiration of this time the mucous membrane is inspected occasionally, the exuberant granulations are removed with the curette, and the cardinal principles of free drainage and free admission of air are utilized as far as the conditions of the individual case will permit. As supplementary measures various forms of tubing may be introduced into the antrum, for drainage purposes, and the membrane may be re-incised as it closes over the aperture. I have occasionally had patients who apparently were cured by treatment through the natural opening, but these evidently were cases in which purulent semi-decayed collections had formed and acted as a leaven to perpetuate the suppurating foci.

When one is called upon to treat a case of antral disease, the difficult problem of selecting the best operative procedure at once presents itself. If it is a case in which the evidence points to a diseased tooth as the causal factor, removal of the tooth is imperative. A certain proportion of these cases may be cured by this procedure alone, without any further interference. And even if the dental disease has already involved the antral walls, causing caries and granulation tissue, in some of these cases a cure may still be effected by drilling a hole into the floor of the sinus through the tooth socket, for the purpose of securing proper irrigation and ventilation. When the granulation tissue extends practically throughout the antral walls and more or less bare bone exists, removal of the nasal wall of the antrum is indicated in either the inferior or the middle meatus, preferably in the former. During the first few weeks after the establishment of such an opening it is usually best not to use any tube. A rubber tube is extremely useful in favorable cases, but if the opening is larger than the head of the tube, the latter is apt to disappear into the antrum and cause annoyance.

With the aid of Dr. Dixon, a dentist of New York City, I have had constructed a permanent tube of gold or silver. A small band is placed around the most available tooth, a silver or gold wire is welded to the band, and then the gold tube is welded to the distal end of the wire. The patient can insert and remove these tubes at will, and when properly made and inserted they give little or no annoyance or discomfort.

The small curette with a malleable handle should be introduced from time to time to ascertain the condition of the mucosa, and if exuberant granulations abound they should be gently curetted.

Thorough cleanliness is essential, but it has been found that too frequent irrigations are injurious. A solution of boric acid or of common table salt is the most acceptable to the mucous membrane. Certain foul-smelling cases have been relieved in a few days by the injection of a mixture of three grains of iodoform in two drachms of liquid albolene; this mixture being left in the cavity for two or three days.

In cases in which polypi develop, it will sometimes be necessary to remove these, at frequent intervals, from different parts of the cavity of the antrum. In cases of sarcomatous disease a complete and thorough removal of all parts of the antrum is necessary; and the same procedure would be advisable in epithelioma if the disease could be detected in the early stages; but, unfortunately, in most cases of epithelioma the disease has already invaded the ethmoid and involved the lymphatics by the time when it is discovered.

II. Diseases of the Ethmoidal Cells.

The ethmoid cells consist of a number of cavities, irregular in size, situated beneath the anterior part of the brain, from which they are separated by a very thin lamella of bone. They lie to the inner, upper, lower, and posterior sides of the inner half of the orbital cavity. They are divided into posterior and anterior cells. The anterior cells communicate with the middle meatus of the nose, and the posterior cells empty into the superior meatus. The anterior cells have several openings. Some open into the infundibulum and cause confusion in differential diagnosis between frontal sinus and anterior ethmoidal cell disease.

The cell of the bulla ethmoidalis opens high up near the attachment of the middle turbinated bone. These cells are frequently hidden from view by the middle turbinal.

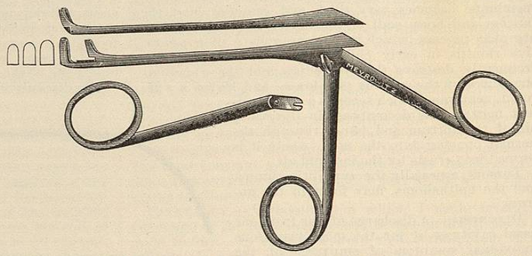

FIG. 3496.—Antero-excisor Forceps for Enlarging Openings in the Accessory Sinus Walls.

ETIOLOGY.—One form of disease of the ethmoidal cells is characterized by an abundance of watery infiltration,

which, if not relieved, usually terminates in the development of a polypoid state. This infiltration, in the writer's opinion, is caused by intumescent pressure upon the venous vessels. The anatomical construction of these cells favors the retention of bacteria and the continuation of the so-called polypoid state when once it has been established. Occasionally the septum or an exostosis or enchondroma protruding from it presses upon the middle turbinal, so as to close the nasal openings, and then degeneration occurs within the ethmoid cells as a consequence. In a few cases an inflammatory and necrotic process in the antrum extends from this cavity to the ethmoid; in others the disease extends from the frontal sinus. Cysts occasionally form in one of the cells and extend backward and forward through the intercellular walls, finally making their appearance above the inner canthus of the eye where the bone is probably thinnest.

Acute catarrhal inflammation of the Schneiderian membrane sometimes obstructs the openings of the cells for a period of several days. This causes putrefaction of retained secretion, and this in turn destroys the mucous lining of the cells. The pus thus formed discharges either through the normal outlet or through an artificial opening. If the pressure has been sufficient to produce necrosis and the drainage has not been free, we have as a result chronic thickening with pus production or watery œdema with polypoid changes.

In cases of syphilis tumors in the ethmoid cells sometimes break down and form the basis for polypoid degeneration. Osteosarcomata in this region are frequently the cause of pain and of a discharge of broken-down tissue products.

SYMPTOMS.—Post-nasal discharge is one of the most common symptoms of ethmoidal cell disease. Dull and deep-seated pain around the orbit, and in the frontal, temporal, and occipital regions is often experienced. In cases in which there is retention of the secretion under tension, the pain varies according to the amount of periosteal disease and the degree of interference with the drainage. The patients show some mental dulness, and especially complain of a disinclination to mental activity. Sneezing, an escape of watery fluid, and more or less nasal stenosis, especially during autumnal weather, are some of the general symptoms of polypoid ethmoidal disease.

DIAGNOSIS.—Diagnosis of ethmoidal cell disease is usually made without any special difficulty. In cases of latent empyema in the individual cells, however, the diagnosis is frequently not made until after the patient has been under observation for some time. The cavity should be thoroughly cocainized and sprayed with adrenalin in 1 to 10,000 solution. The nose should be cleansed of all secretion, careful note being made of the examination with a probe around and within the ostia of the respective cells. Cotton applicators should be used. To cleanse thoroughly the region of the suspected ostium, time should be allowed for the discharge of more pus before a second examination is made with the soft silver probe to ascertain whence the discharge comes. A small posterior rhinoscope is most useful in demonstrating secretion in the superior meatus. The extent to which the pathological process has advanced, and the question whether there is an œdematous, a polypoid, or a sclerosed state, are matters which can be determined partly by the patient's appearance, and especially by the character of the pus and mucus. The probe will convey a good idea of the state of the mucous membrane, but it frequently misleads us in regard to the condition of the bone. The combined periosteum and mucous membrane of these bones is very thin, and often it feels as if the probe were on exposed bone when as a matter of fact the latter is in a fairly normal state. This has led many of our best writers into controversies in regard to diseases of this region.

TREATMENT.—Whenever there is extensive serious disease in the ethmoid bones it is the wiser policy to remove a part of the middle turbinal at once. This rule would not hold good, however, in all atrophic cases. In the polypoid cases all visible polypoid tissue should be removed with the snare or excisor forceps; when there are intracellular polypi the floors of the sinuses should be removed with trephines provided with specially constructed guards and by means of lateral and antero-posterior cutting forceps. The curette provided with a malleable handle has proved most serviceable in removing intra- and intercellular diseased tissue and cells. The securing of free drainage and the free admission of air are just as important here as they are in the case of the antrum. In removal of the middle turbinal the lateral cutting forceps should be passed beneath the septum and the outer wall, engaging the middle turbinal between its jaws, and then a section of the bone should be removed. This enables the wire écraseur to be easily adjusted around either the anterior or the posterior end. I have found the smallest cannula and the Bosworth snare to be the most feasible instruments.

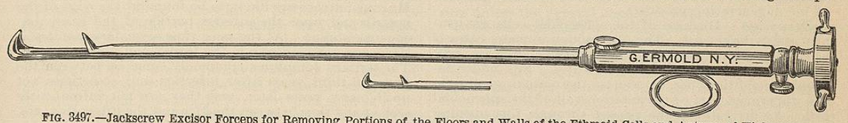

FIG. 3497.—Jackscrew Excisor Forceps for Removing Portions of the Floors and Walls of the Ethmoid Cells and Antrum of Highmore.

The proximity of the ethmoid cells to the orbital cavity and the brain, and the necessity of operating in a field covered with blood, should make the boldest operator cautious. With the aid of cocaine and adrenalin and with the patient's assistance, the difficult operation of penetration and removal of the floor of the sinus is made comparatively easy and safe. When the artificially established openings in the cells are large enough they usually drain so well that it is necessary to irrigate them at stated intervals only. When the process extends far up into the little cells above the orbital cavity or into some of the recesses under the cranium the results of treatment are not so satisfactory. I have found the daily insufflation of a powder composed of aristol two parts, boric acid one part, to be the most satisfactory after-treatment. When there is considerable pus a modified spray of Dobell's solution or of a solution made with Seiler's tablet is effective. Under this treatment the patient usually makes marked improvement. Frequently, however, a small amount of discharge continues from some inaccessible cell, and often also the condition is aggravated temporarily by taking cold.

III. Diseases of the Sphenoidal Cells.

Inflammation of the sphenoidal cells is usually consequent upon acute rhinitis, especially when due to infection. Polypoid changes are frequently the cause of chronic disease. Syphilis commonly affects the cell wall with a gummatous deposit and the ethmoidal mucocele occasionally extends through the dividing cell. Tumors sometimes develop in or extend into the cavities.

SYMPTOMS.—The subjective symptoms of an acute inflammation of the sphenoidal sinuses are headache and a full, heavy feeling over and behind the eyes. In cases of chronic suppuration there are deep-seated pains in the orbital, temporal, and occipital regions, feelings of depression and oppression, discharge of pus or muco-pus over the anterior surface of the sphenoidal cell at the posterior extremity of the middle turbinal body, and disturbances of the field of vision. The objective symptoms are hyperplastic œdema of the nasal mucosa cover-

ing the cell, discharge of pus and muco-pus, polypi, and pharyngitis sicca, due to destruction of the epithelium by the pus, which flows constantly over the postpharyngeal wall.

Pathology.—Changes involving the bone substance and the lowering of its vitality occur in those sphenoidal cases in which the mucosa has undergone polypoid degeneration. The bone becomes brittle under these circumstances and loses much of its cohesive quality. In neglected syphilitic cases necrosis of the bone or soft tissues always follows the gummatous process. The chronic suppurative cases with more or less stenosis of the normal opening are usually protracted by the irritating qualities of the degenerating products.

Fig. 3498.—Guarded Trephine for Removing Obstructing Portion of the Septum near Anterior End of Middle Turbinal.

Diagnosis.—Diseases of the sphenoidal cells are usually easily diagnosed. The obstruction in many cases is at the posterior end of the middle turbinal, and its early removal will facilitate matters greatly. Pus under favorable conditions can be seen at the normal opening in the uppermost part of the anterior wall of the sphenoidal cell. An irrigation tube passed through this opening will confirm the provisional diagnosis.

Treatment.—The treatment of sphenoidal disease is more satisfactory in its results than that of the other sinuses. Complete removal of the posterior end of the middle turbinal will usually demonstrate the point from which the pus makes its exit. The upper anterior wall should be penetrated with a guarded awl or trephine and afterward curetted. Extensive removal of the anterior wall with a cutting forceps, gentle curettage, irrigation, insufflations, and repeated excisions of the membrane which forms over the opening will often cure the most obstinate and apparently hopelessly diseased conditions of the sphenoidal sinuses.

I do not favor the procedures of opening the sphenoidal cells through either the antrum or the ethmoidal cells, as I do not think such extensive destruction of tissue is warranted. *Robert C. Myles.*

NASAL CAVITIES, DISEASES OF: SYPHILIS.—Syphilis, either congenital or acquired, may appear in the nose in any of its three stages. The disease is characterized by obstruction of the passages from swelling of the mucous membrane, or by more or less extensive ulceration with destruction of cartilages and bone.

Anatomical and Pathological Characteristics.—The mucous membrane may be found thickened in patches or ulcerated, or obstruction may arise from gummatous thickening of the perichondrium or periosteum. In the latter case the cartilage or bone beneath often suffers necrosis and is finally separated by the process of suppuration. Necrosis occasionally results from extension of the ulcerations from the mucous membrane, and rarely the parts undergo molecular destruction and are gradually absorbed, being replaced by granulation tissue. Primary syphilis is occasionally conveyed to the nose by picking with the finger nail, but the hard chancre is very seldom seen. On the external nose the primary sore usually appears as a flat induration of moderate size; within the nose it commonly occurs on the septum as a red, flat, hard growth covered with purulent secretions, which bleeds easily, the external nose at the same time being swollen and red. Neuralgic pains and fever may coexist and the submaxillary and sublingual glands and those in front of the ear are often indurated. In secondary nasal syphilis the appearances may be simply those of an acute coryza, or mucous patches may be found upon the Schneiderian membrane similar to those so commonly observed in the throat. In this case copper-colored papules or macules with fissures at the junction of the nose and the upper lip or in the sulcus alaris are apt to be present. Gummatous syphilitic infiltrations may involve the mucous membrane, the perichondrium, or the periosteum. These soften after a time and deep, sharp-cut ulcers with undermined borders result, with sooner or later destruction of cartilage or bone. Often this destruction is limited to the septum, especially its bony portion; but in some cases it involves all of the surrounding parts. When the nasal bones are destroyed the bridge falls in, but this does not occur from destruction of the septum alone.

Etiology.—The affection is caused by the specific virus which may infect the fœtus in utero or during birth, or which may be acquired afterward in various ways.

Symptomatology.—Primary syphilis of the nose causes the symptoms of an acute catarrhal rhinitis of a severe grade. The initial lesion is likely to be comparatively large, and various lymph glands may be infected and greatly swollen. In the secondary stage there are much congestion of the mucous membrane and abundant muco-purulent secretion with obstructed respiration. Mucous patches are likely to be found at the edge of the nostrils and upon the anterior portion of the nasal mucous membrane. At the same time secondary manifestations are apt to occur in the throat and upon the skin. The tertiary symptoms commonly come on between the first and third years after infection, but sometimes not until many years later, and they are not infrequently seen at any time between the fifth and the fifteenth years. When the disease attacks the turbinated bodies it sometimes causes an appearance very like that of simple hypertrophic rhinitis and the parts do not retract readily under cocaine; but this condition is frequently associated with yellowish ulcers having a clean-cut border and hard infiltrated base with more or less induration about the ulcer, and is therefore not apt to be confounded with hypertrophic rhinitis. When the disease attacks the periosteum or the perichondrium, a smooth elastic swelling results which is usually apparent upon only one side. Later, breaking down takes place and ulceration results. The denuded cartilage or bone dies and is subsequently separated by an ulcerative process from the surrounding tissue. Commonly the patients do not present themselves for treatment until ulceration has occurred, and then the necrosed cartilage or bone may be found firmly attached or lying partly loose in the nasal cavity. Atrophy of the turbinals may also occur and destruction of the orbital plate of the ethmoid bone and of the hard palate is not uncommon. The dead bone usually presents a blackish, uneven surface, and is the source of an extremely offensive odor.

Diagnosis.—The primary lesion in the nose may be mistaken for a malignant growth. The most valuable points in the diagnosis are its hardness and the great swelling of the lymphatic glands. Frequently the true nature of the disease is not recognized until the secondary symptoms appear. The secondary stage of the disease in the nose causes the symptoms of chronic catarrhal rhinitis, but it comes on much more speedily than the latter, and by careful inspection mucous patches or condylomata may sometimes be detected. The history of the case should be very carefully scrutinized, and any external manifestations may aid in the diagnosis. Tertiary syphilis of the nose is not likely to be recognized when it involves the turbinals alone, as the appearance is that of hypertrophic rhinitis; but when gummata and ulceration occur, a careful weighing of the history of the antecedent symptoms and signs will generally enable one to make a correct diagnosis, although often the patient will deny any specific infection. There is generally no difficulty in distinguishing tertiary nasal syphilis from atrophic rhinitis if the nasal cavities be first thoroughly cleansed. It should be recollected that simple perforation of the cartilaginous septum is seldom syphilitic, whereas perforation of the bony septum is nearly always so.

Lupus is to be distinguished from syphilis, first by the fact that it usually occurs at an earlier age than syphilis, excepting when the latter is hereditary; second, that the

reddish papules or tubercles of lupus are quite distinct from many syphilitic manifestations, and that they are often associated with distinct signs of lupus externally. Lupus also is much more prone to attack the cartilage than the bone, and it is much slower in its progress than syphilitic ulceration.

Prognosis.—The outcome of nasal syphilis is materially affected by early recognition of the disease and efficient antisyphilitic treatment. Although in many cases the destructive process is not extensive, in others not only the septum but the nasal bones, orbital plates, and hard palate are involved in widespread necrosis. In rare cases the disease progresses rapidly in spite of all treatment, and may terminate fatally within three or four months. Death has also resulted from fragments of the necrosed bones falling into the larynx.

Treatment.—Secondary symptoms and those of the tertiary disease, when mild, usually yield rapidly to appropriate internal and local treatment. In syphilitic affections of the nose, prompt and thorough antisyphilitic treatment should be immediately instituted, the nares should be kept clean by mild alkaline sprays or washes, condylomata or mucous patches should be touched with nitrate of silver or tincture of iodine, and the latter or solutions of from ten to twenty grains to the ounce of sulphate of copper should be used in case of tertiary ulceration. Dead bone should be removed as soon as it becomes loosened, and sometimes it is best to cut it away earlier in order to prevent the prolonged offensive odor; but it should be recollected that if the bone be cut away too early, the disease is liable to extend to tissues that would otherwise have escaped. Antiseptic sprays and powders, such as are recommended in the article on atrophic rhinitis, may also be employed advantageously.
E. Fletcher Ingals.

NASAL CAVITIES, DISEASES OF: TUBERCULOSIS.—Though tuberculosis seldom involves the nasal cavities, secondary tuberculous lesions are occasionally met with in this locality and a few cases of the primary disease have been noted. Michelson observed nineteen instances of the primary disease in thirty-eight cases of nasal tuberculosis. It should be remembered, however, that the early symptoms and signs of the pulmonary affection are not always recognizable, so that they may have been present in some of the cases believed to be primary nasal tuberculosis.

Anatomical and Pathological Characteristics.—The disease may be observed as a diffuse infiltration, or as a tuberculous tumor with or without ulceration, or in the form of exuberant granulations. Ulcers may follow the infiltration or the tuberculous tumors, but they sometimes appear to be the primary lesion; however, they are nearly always secondary to pulmonary tuberculosis. The disease commonly attacks the anterior part of the cartilaginous septum, but it may involve any portion of the nose or nasopharynx. The tumors are generally small and of a grayish-white color, but may attain the diameter of 2 or 3 cm. before they finally break down. They are sometimes pedunculated, at other times sessile, and they commonly bleed easily. The tuberculous infiltration is prone to attack the septum, but may also invade the turbinals. It causes a firm, resistant swelling of a pale color having a somewhat granular surface. This, like the tumors, is ultimately followed by ulceration. The tuberculous ulcer is generally round or oval and at first shallow, but ultimately it becomes much deeper. The borders are irregular, having a worm-eaten appearance; they may be level or may be prominently raised by tuberculous infiltration. Miliary tubercles may often be seen on the floor of the ulcer and surrounding it. The floor of the ulcer is of a pale, grayish-red color and is sometimes covered with granulations, while the miliary tubercles which surround the ulcer are translucent or of a yellowish or grayish-white color. On breaking down they cause irregularity of the edge of the ulcer, and by the extension of the process the cartilage or even the bone may be destroyed, leading to perforation. Exuberant granulations may spring up and hide the ulcer or perforation or even a tumor. They are analogous to fungous granulations found in other parts of the body.

Etiology.—The causation is the same as that of other forms of tuberculosis.

Symptomatology.—The disease comes on insidiously, causing the symptoms of an offensive rhinitis with free purulent discharge, which tends to collect and form scabs and crusts that hide the ulcers. Epistaxis is an occasional occurrence. At first the constitutional symptoms are slight. In the majority of cases this affection is secondary, and in nearly all instances it terminates with laryngeal or pulmonary tuberculosis.

Diagnosis.—The disease is to be distinguished from lupus and syphilis. Lupus resembles the infiltrated form of nasal tuberculosis, but commonly begins in the integument and slowly extends, showing a marked tendency to cicatrization, whereas the tuberculous ulcers spread more rapidly and there is little if any tendency to healing; indeed, it is impossible to cure one of these ulcers unless the general condition improve.

Syphilis, especially in the late hereditary form, is sometimes very difficult to distinguish from tuberculosis, but usually its more rapid course, the headaches and neuralgias that are apt to accompany it, and its proneness to attack the bone instead of the cartilage distinguish it from tuberculous disease. The antecedent history may be of great value in the diagnosis, and a microscopical examination of the secretions or the scrapings from the ulcers or granulations is liable to reveal the tubercle bacilli, though the latter can seldom be discovered in the infiltrative form or in the tuberculous tumor. The results of treatment are also important—a syphilitic ulcer usually improves speedily under specific medication, whereas the same treatment is likely to aggravate tuberculosis.

Prognosis.—The course of the disease is slow unless the lungs be already involved, and it may possibly extend over several years; but when the tuberculosis also affects other organs it runs a more rapid course to a fatal termination.

Treatment.—Detergent sprays and washes may be used to keep the nares clean, and tuberculous tumors that interfere with respiration may be removed by the snare or otherwise. The infiltrations are best destroyed by the sharp spoon or by electrolysis; fungous granulations may be scraped away with a curette and the base treated with lactic acid; indolent ulcers may be curetted and then treated with lactic acid. In these cases the parts should be anæsthetized as thoroughly as possible, and lactic acid of a strength from fifty to one hundred per cent. should be carefully applied. It is well to add to it from three to five per cent. of carbolic acid in order to prevent prolonged pain after the effects of the cocaine have disappeared. In some instances excellent results have been obtained by carefully touching the surface of the tuberculous ulcer with the galvanocautery. It is of prime importance to attend to the general health, because until this is improved we cannot hope to obtain much betterment in the nose. Even in primary cases we can scarcely hope to remove all of the tuberculous tissue by curettage or by other surgical measures, and therefore we can seldom, if ever, completely cure the disease.
E. Fletcher Ingals.

NASROL—sodium sulphocaffeate, symphorol sodium—is a bitter crystalline powder slightly soluble in cold water. It is a more powerful diuretic than caffeine, and the caffeine effect on the heart is said to be lessened. Dose 1 gm. (gr. xv.) daily. *W. A. Bastedo.*

NASSAU.—The town of Nassau, capital of the Bahama Islands, lies on the north shore of the island of New Providence, at a distance of about two hundred miles due east from the southern point of the Florida peninsula, and about thirty miles north of the parallel of latitude which passes through Key West. The exact latitude of Nassau is 25° 5′ 36″ N., only two degrees north