experience, I proceeded at once, after having completed my operation, to close the wound in the sinus by catgut sutures. This I had little difficulty in doing, as the wound was but small and the sinus at this point not large. The scalp covering was adjusted in the ordinary way, and the wound healed without the slightest interruption. No bad symptoms followed, and my patient made a perfectly satisfactory recovery.

Case 3.—Case No. 3 was a young man, Mal Dortan, who had four months previous fallen quite a distance alighting on the back part of the vertex. He had sustained a rather long transverse fracture of the skull, with a very marked depression of bone. He had no epileptic seizure, but suffered continuously from headache, so as to entirely invalid him. A trephining operation being determined upon for the removal of the depressed bone, I proceeded to do it at the clinic, in the presence of the class of the University Medical College.

After the scalp had been carefully raised and the bone exposed, I remarked to the class witnessing the operation, that there was an extraordinary amount of blood flowing from the bottom of the fissure, and that either a large vein or the superior longitudinal sinus had been wounded. Upon the removal of the bone down to the bottom of the valley of the depression, the blood flowed much more freely, showing very plainly that it came from the sinus.

As soon as the last piece of bone was lifted a large opening was discovered in the sinus—an opening as large as a lead pencil. The blood flowed from the wound in a stream, very much as if it had been poured from a teapot. My former experience gave me no assurance that I would be able to close this wound.

The edges of this wound were undoubtedly healed over. It was simply a great irregular wound in the upper and back part of the superior longitudinal sinus, just before it divides to form the lateral sinuses. I determined, however, to make the attempt to close it, and hoped—perhaps without any very good grounds—that my efforts would be successful. I had a good deal of trouble in drawing the edges together; in fact I very much question whether the edges were brought together at all or not. I did succeed, however, in almost completely arresting the flow of blood, a simple oozing being all that was left. The area of bone removed was quite large and I was fearful of oozing under the flaps. I placed at two or three points capillary drainage. I adjusted the flap over the wounded sinus as well as possible, and hoped to get as good results as I had in the two former cases.

Circumstances over which I had no control prevented my dressing him at the next clinic, and he was dressed by the hospital dresser, who inadvertently pulled out the capillary drainage in removing the dressings, and thinking he had to replace it by something else, put in some rubber drainage tubes that were undoubtedly infected. When I next dressed the wound—one week from the day I operated—I found to my horror purulent fluid issuing from the drainage tubes. I dressed it with all the care I knew how, and cleansed it with all the antiseptic precautions. It was with fear and trembling that I visited the hospital each day for the next two weeks, thinking that each time I should find my patient comatose from the entrance of pus

into the sinus. Nature, however, had done more for me than I had given her credit of being able of doing, in having so carefully and completely sealed up this vulnerable point.

Suppuration continued from one of the drainage tubes for almost three weeks, but no bad symptoms resulted from it. The wound in the sinus was safe, having been completely sealed up by the flap, the suppuration never extending to it.

I have been thus careful in reporting the results of these cases, with the purpose of encouraging surgeons in this line of treatment. Believing that the wall of the sinus if kept thoroughly aseptic, and closed without the lining of the membrane of the sinus being wounded by the surgeon, would heal just as a wound will in any other part. Particularly so if it is immediately closed over by clean, healthy tissue. In my judgment, it is preferable to the method so generally recommended of packing, and hoping that it may heal by a clot, the danger of which I think is very great.

RHINITIS IN CHILDREN; ITS VARIETIES, CAUSES AND TREATMENT.

Read before the Illinois State Medical Society, May 15, 1893.

BY W. E. CASSELBERRY, M.D.

CHICAGO.

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The forms of rhinitis which affect children are, in the main, subject to the same classification as when affecting adults. Various phases of the disease, however, both in pathology and clinical history, assume in childhood different degrees of importance, by reason of special tissue proclivities which are incidental to early life, and of unusual damage liable to ensue in a child from neglect of the disease during the developmental period. The treatment also requires special adaptation to the comparative helplessness and timidity of young children.

ACUTE RHINITIS.

Acute rhinitis, colloquially termed "cold in the head," is an acute inflammation of the mucous membrane lining the nasal cavities from the anterior nares to the naso-pharynx. It is prone to extend to adjoining mucous surfaces and usually embraces the naso-pharynx, at least to some degree, and thence not infrequently also the middle ear.

Etiology.—Reasoning from analogy, one must regard acute suppurative rhinitis as an infection by pathogenic micro-organisms, but it is a result of "taking cold," which follows certain exposures with such regularity and precision that one must also infer a causal relationship to exist between chilling of the body and rhinitis. The congestion of the nasal vessels occasioned by "taking cold" evidently favors a microbic invasion of the mucous membrane by, in some manner, impairing its powers of resistance.

Instances are not wanting of direct infection of one person by the discharges of another, an accident which is apt to happen among children by the use of handkerchiefs in common. Suppurative rhinitis of

infants is also attributable to direct infection from the vaginal discharges during birth, and to want of cleanliness after birth.

Treatment.—It is much too customary to permit this acute inflammatory disease of a delicate part of the body to progress without efforts to mitigate and abbreviate it. Such a course is fraught with immense possibilities of ultimate damage, chronic catarrh of the nose and accessory organs being thereby established. Many remedies are of real service, but a multiplicity of recommendations is confusing and tends to lessen confidence in any one line of treatment. I will therefore describe simply my own methods of dealing with these cases.

If it is sought to abort the attack of rhinitis, a single average-sized dose of Dover's powder, proportionate to the age of the child, is given at bedtime, also a laxative if needed. The patient is especially well covered in bed, outside night air is excluded and the temperature of the apartment maintained during the night at 60° to 64° F., but no effort is usually made to produce profuse perspiration.

Internally, the following formula will meet the indications:

R. Tr. aconiti, m.xii.
Tr. belladonnæ, m.xxiv.
Morphinæ sulphatis, gr. ¼.
Potassii bromidi, ʒi.
Spts. menthæ piperitæ, m.xx.
Aque q. s. ad. fʒiii.

M. et. Sig.: Adult dose one teaspoonful every hour, to be lessened for children according to age.

The same ingredients could readily be prepared in the form of a capsule, pill, or compressed tablet.

Local treatment is of the utmost importance, and the following mixtures render satisfactory service by atomization;

SPRAY No. 1.

R. Cocainæ hydrochloratis, gr. ii.
Sodii boratis, gr. xx.
Sodii bicarbonatis, gr. xx.
Ol. eucalypti, m. i.
Ol. gaultheriæ, m. i.
Thymol, gr. i.
Menthol, gr. ½.
Glycerinæ, fʒss.
Aque q. s. ad. fʒi.

M. et. Sig.: Dilute, adding one or two teaspoonsful to one ounce of warm water for use as a spray.

SPRAY No. 2.

R. Cocainæ hydrochloratis, gr. ii.
Ol. pini canadensis, m. v.
Ol. gaultheriæ, m. ii.
Ol. eucalypti, m. ii.
Thymol, gr. ½.
Menthol, gr. i.
"Vaselin oil," fʒi.

M. et. Sig.: Use with double bulb (Davidson) atomizer, either alone or following the use of spray No. 1.

For young children who are often terrified by spraying, may be substituted a small syringe or an ordinary medicine-dropper used as a syringe, with which to project gently either of these solutions through the nostrils. Spraying or gentle syringing in this manner may be performed twice or three times daily or even every three hours in severe cases. The cocaine can be omitted from either spray formula if there is any objection to its use, without seriously impairing the effectiveness of the remedy. All solutions for nasal use should be somewhat warm.

Of the many inhalations, I will mention only camphorated steam as a domestic remedy of power.

It is conveniently used by placing a pint of steaming hot water in a glass fruit jar and adding two fluid drachms of spirit of camphor. A funnel, preferably of glass, is then inverted to cover the mouth of the jar and the rising steam is inhaled through the nostrils as it escapes from the small end of the funnel. So used, especially during the evening for a half-hour, it conduces to a comfortable night's rest and facilitates recovery.

SIMPLE CHRONIC RHINITIS, INCLUDING CHRONIC PURULENT RHINITIS OF CHILDREN.

Recurrent attacks of acute rhinitis establish in children and young people especially, a chronic inflammation of the mucous membrane which is characterized by variable degrees of proliferation of the epithelium, and by muco-purulent secretion which is often profuse. The disease is not accompanied by material enlargement of the turbinated bodies or distension of the erectile tissues, and stenosis is not a prominent symptom which differentiates it from hypertrophic rhinitis.

Etiology.—Bosworth plausibly contends that children are particularly prone to inflammation of the epithelial lining of mucous membranes, and that the epithelial proliferation of muco-lymphoid glands becoming organized without desquamation accounts for enlargement of the tonsils, etc., while an allied inflammation in the nose with rapid desquamation of the epithelium constitutes the most important element in purulent rhinitis. The disease bears no constant relationship to scrofula, tuberculosis or syphilis since it affects children who are otherwise robust quite as frequently as it does the subjects of these dyscrasiæ. Inattention to hygienic matters, leading to frequent attacks of acute rhinitis, and failure to treat the same effectively, are potential factors in the establishment of this form of catarrh.

Symptomatology.—A profuse muco-purulent discharge from both nostrils, swelling and redness of the external nasal appendage and excoriation with incrustation of the anterior nares are the chief manifestations, a too profuse discharge being the sole complaint in the milder cases.

In the course of years, if the purulent type of rhinitis be not arrested, the mucous glands, atrophy, the secretion grows less, but thicker, and tends to accumulate in crusts. In other words, the disease may pass gradually into the atrophic form of rhinitis which is the successor to purulent rhinitis perhaps more frequently than it succeeds hypertrophic rhinitis, although commonly credited to the latter disease.

Simple chronic rhinitis, however, does not always assume a purulent type, the chief symptom oftentimes being merely a too profuse mucous discharge. This form of the disease is prone to pass gradually into hypertrophic rhinitis; in fact, it is sometimes difficult to draw a distinct diagnostic line between either the purulent or non-purulent form of simple chronic rhinitis on the one hand, and hypertrophic rhinitis on the other. Indeed, in rarer instances these conditions are seemingly associated.

Treatment.—In the purulent type muco-pus must not be permitted to accumulate and decompose in the sinuosities around the turbinated bodies, thus perpetuating the disease. In not too inveterate cases thorough cleansing by means of an antiseptic, alkaline and mildly astringent spray, used three or

four times daily, with a hand-ball atomizer, is all that is necessary to effect a cure. The following modification of Dobell's solution answers this purpose admirably:

R. Sodii boratis, gr. xv.
Sodii bicarbonatis, gr. xv.
Ol. eucalypti, m i.
Ol. gaultheriæ, m i.
Thymol, gr. i.
Menthol, gr. ½.
Glycerini, f 3ss.
Aque, q. s. ad. f 3i.

M. et. Sig.: To be diluted adding two teaspoonsfuls to one ounce of warm water for use as a spray.

If a more active astringent is necessary to check the hypersecretion, sulpho-carbolate of zinc, two to five grains to the ounce, may be used as a spray, following the cleansing solution.

In young children who are terrified by spraying, these solutions, well warmed, can be used by means of a small syringe. When the purulent type of the disease is complicated by the presence of hypertrophy of the turbinated bodies, deformity of the septum, adenoid vegetations, etc., any of which obstructions will impair the drainage, and cause a mucopurulent discharge, surgical treatment appropriate to this special cause or complication is usually indicated. However, the case would not then be regarded, strictly speaking, as one of *simple* chronic rhinitis.

HYPERTROPHIC RHINITIS.

This is a chronic inflammation of the mucous and submucous tissues of the nose, characterized by enlargement, especially of the turbinated bodies, which encroach upon the normal lumen of the nostrils, and cause impairment of nasal respiration and drainage. The disease is thought to be rare with children, especially under ten or twelve years of age, but I am convinced that a mild form or early stage of the affection is very common at all ages.

In children and adolescents persistent enlargements of the turbinated bodies can and do present themselves, in consequence of mere dilatation and engorgement of the vessels of the submucosa, without any considerable degree of cell proliferation, but in addition to this "intumescent form," even somewhat advanced grades of hypertrophic rhinitis are certainly met with in children.

Etiology.—The most prolific source of hypertrophic rhinitis in young children is adenoid vegetations, which, by partial occlusion of the posterior choanæ, interfere with the proper drainage and evaporation of nasal secretion, the irritation of retained and decomposing secretions serving to excite proliferative changes in the nose.

Clinically these conditions are frequently conjoined and it is certain that they sustain some dependence upon each other, for removal of the "adenoids" is often followed by subsidence of the nasal hypertrophies. Recurrent acute rhinitis is another potent factor in the development of hypertrophic rhinitis.

Symptomatology.—Nasal stenosis or obstruction on one or both sides is the most prominent symptom. The secondary results of nasal stenosis, are a nervous restlessness, which is excited in many by the sense of obstruction and pressure in the nose, inability to sleep soundly at night, or intellectually to apply themselves persistently by day, together with headache and reflex pressure symptoms such as hemi-

crania, asthma and spasm of the glottis. The most frequent of the reflex nasal symptoms in childhood, are asthma in association with bronchitis and spasm of the glottis in association with laryngitis; in fact, so common in children is dependence, at least in part of chronic bronchitis, with asthmatic symptoms upon nasal stenosis and adenoid vegetations that the closest scrutiny and attention should be given to the upper respiratory tract in all such cases.

The term "reflex" is doubtless often misappropriated, yet it has a definite significance, and the pathological reflexes which originate in nasal or nasopharyngeal irritation and terminate in cough, laryngeal spasm, or asthma, follow much the same pathway as the physiological reflex known as sneezing.

A very annoying symptom and one which may first attract attention is dysphonia; in fact, such children are constantly declared to be tongue-tied, and the lingual frænum cut without benefit, when the real defect in speech lies in occlusion of the nares or naso-pharynx.

Treatment.—When dependent upon adenoid vegetations, the surgical removal of these growths usually results in subsidence of the hypertrophic rhinitis. Resolution will be favored in such cases, however, as well as in the milder forms of the disease, not secondary to naso-pharyngeal adenoid hypertrophy, by the use, twice daily, of an antiseptic alkaline and mildly astringent spray, or lotion formulated as prescribed for "simple chronic rhinitis." This is especially important as a cleansing measure in cases in which some degree of hypertrophy is conjoined with the suppurative type of rhinitis. Refined petroleum products variously known as "albolene, lanoline, benzoinol," etc., are just now extensively employed in many combinations in all forms of rhinitis, but antiseptic alkaline aqueous solutions are certainly more effective when the parts are to be cleansed of muco-purulent accumulations. Petroleum sprays are, however, often soothing and protective to the parts, especially at times of acute and subacute exacerbations, and may be used in such cases following the aqueous spray twice daily, or used alone with patients who have no retained muco-purulent secretions. "Vaseline oil," being more viscid than the whiter products, and yet sufficiently fluid to be converted into spray by a good double bulb hand atomizer, is best adapted to this use, and may be prescribed in the following combination:

R. Ol. pini canadenses, m. v.
Ol. gaultheriæ, m. ii.
Ol. eucalypti, m. ii.
Menthol, gr. i.
Thymol, gr. ½.
Vaseline oil, q. s. ad., 3i.

M. et. Sig.: Use with a double bulb atomizer.

A more astringent spray is occasionally beneficial, although strong astringents are not well borne by the nasal mucous membrane:

R. Zinci sulpho-carbolatis, gr. v.
Iodi, gr. i.
Potasii iodidi, gr. ii.
Menthol, gr. i.
Ol. gaultheriæ, m. iii.
Glycerini, f 3ss.
Aque q. s. ad., f 3i.

M. et. Sig.: Use with atomizer.

NOTE.—Vaseline oil or albolene can be substituted for the glycerine and water of this formula.

Persistent use of these remedies together with the surgical removal of adenoid vegetations and enlarged

faucial tonsils, and hygienic guards to prevent frequent "colds" will effect a recovery in the majority of cases of hypertrophic rhinitis of children. A minority, however, which includes especially the older children, will not yield to this treatment and will require reduction of the hypertrophy by means of the electro-cautery in order to overcome the nasal stenosis. One should not hesitate to adopt this method in suitable subjects for the results are very satisfactory.

ATROPHIC RHINITIS.

Also termed cirrhotic rhinitis, dry catarrh, ozæna and fetid rhinitis, is characterized by atrophy and cirrhotic changes in the nasal mucous and submucous tissues, including the turbinated bones, which lead to increased spaciousness of the nostrils; also by atrophy with impairment of function of the mucous glands, by reason of which the muco-purulent secretion becomes inspissated and accumulates in the form of crusts, which in turn, undergo decomposition and occasion fetor.

Etiology.—The commonly accepted theory that atrophic rhinitis is a sequel to hypertrophic rhinitis, a late stage of that disease, is now receiving much adverse criticism. It is true that an *apparent* transition is occasionally observed, but that the previous hypertrophy was the real and essential cause of the subsequent atrophy is exceedingly doubtful. I have observed the two conditions to exist at the same time in the same individual—atrophy in one nostril and hypertrophy in the other, and even atrophy and hypertrophy in different parts of the same nostril; but the only cases in which I have observed distinct hypertrophy to pass definitely and completely into the atrophic condition were those affected with grave constitutional disease, notably tuberculosis and syphilis.

The average life histories of the two affections are dissimilar. At least one form of atrophic rhinitis is common in childhood and the disease rarely originates after thirty-five or forty years of age.

Hypertrophic rhinitis with permanently organized infiltration of a degree sufficiently advanced to pass as alleged, into the atrophic state, does not commonly occur, at least until maturity; hence, this theory fails to afford an adequate explanation of the many cases of atrophic rhinitis which occur in early life. Bosworth has advanced the most rational explanation of the etiology of atrophic rhinitis of early life in designating "suppurative rhinitis of children" as the real cause, a view which harmonizes with the life history of the disease, and which is of especial value from a prophylactic standpoint, since it teaches us the importance of promptly suppressing chronic suppurative rhinitis, viewed as a cause, the ultimate effect of which, atrophic rhinitis, is itself difficult of suppression.

Hereditary predisposition to atrophic rhinitis is often pronounced. For instance, a patient, æt. twenty-two, has developed the disease during the last two years; her mother, for some years deceased, suffered from the disease in a typical form; the patient's child, aged three years, is likewise affected.

Symptomatology.—Crust formation and fetor are the most prominent symptoms of the disease, although other secondary manifestations are numerous. The crusts may accumulate only in thin scales, or in large masses of horny consistency which may even

occlude the nostrils at times, being firmly adherent and impacted in the sinuosities of the nares, until by decomposition and softening of the layer adjoining the mucosa they are finally cast loose and expelled in large pieces by blowing, often leaving abraded surfaces behind.

The fetor varies in intensity in different cases, but is rarely entirely absent, and in its severe form is so horribly nauseating and penetrating as to contaminate the atmosphere of an entire room in a few minutes, and to necessitate comparative isolation of the patient. The fetid odor is apparently due solely to decomposition of the incrusting secretion *in situ*, but there is reason to believe that this decomposition may extend to the secretion which is still in process of elaboration in the substance of the glands themselves.

In advanced cases, commonly, the sense or hearing is impaired, the patient's own smell obtunded, the external nose broadened, its alæ thickened, and the physiognomy lacking in acuteness of expression. The disease extends after a time to adjoining surfaces, constituting atrophic naso-pharyngitis and atrophic pharyngitis. The naso-pharynx becomes so incrustated that the fetid masses must be literally pried out with probes and forceps. More rarely, even the larynx and trachea become involved, crusts accumulating in these passages to the point of occasioning dyspnoea.

Diagnosis.—On rhinoscopic examination, both anteriorly and posteriorly, one is impressed by the spaciousness of the nasal cavities and the presence of scales or crusts. The disease is likely to be confounded, especially in childhood, with hereditary syphilis of the nares, which is also accompanied by fetor and incrustation. Unfortunately, by reason of the fetor the term "ozæna" has been applied to both diseases, consequently it is a bad name for either affection, especially since it refers only to the symptom—fetor.

In atrophic rhinitis, there is uniform atrophy and incrustation without deep, destructive ulceration.

In hereditary nasal syphilis the atrophic process, if present at all, is not uniformly distributed, the nostrils being contorted by deep ulceration with subsequent cicatrization of various parts.

Prognosis.—Atrophic rhinitis requires persistent thorough treatment over a period of from four months to two years, in order to effect recovery even in young subjects and in recent cases. Both patient and physician are prone to become discouraged and to abandon treatment, much to the disadvantage of the former. Inveterate cases must continue cleansing measures for years, as part of the toilet, with the same regularity that is given attention to the teeth. In the worst cases the difference between persistent treatment and total inattention, is the difference between the lot of an acceptable member of society and that of a social outcast.

Treatment.—The first essential to successful treatment is absolute and continuous cleanliness of the parts. The crusts must not be allowed to form, much less to undergo decomposition. One of the most efficient means to this end, especially for children, is the nasal douche. I believe it to be justifiable for the sake of efficient treatment of this particular disease to assume the slight risk of inflammation of the ear, possible by this instrument. This risk, with proper use of the instrument, is remote in

comparison with the danger from atrophic rhinitis, ineffectually cleansed. The original instrument of Thudicum was of glass, but the ordinary soft rubber bag gravity douche fitted with a nasal nozzle, answers the purpose still better. It should be suspended from a nail over a convenient basin at such a moderate height that the bottom of the bag is only about three inches above the level of the nose, as the head is held over the basin. The patient must maintain breathing by the mouth well opened, when on applying the nozzle to one nostril the liquid will gravitate gently and slowly into one nasal passage and out through the other, the oral respiration sufficing to close the naso-pharynx by the velum palati. Not force, but thorough maceration, is requisite to detach the crusts, therefore one to two pints of fluid should be gently and slowly used, twice daily as a part of the morning and evening toilet. The liquid employed should be alkaline, to facilitate solution of the crusts, *antiseptic*, to counteract the feter, and *stimulating*, to encourage regeneration of the atrophied glands. These qualities are provided in the following formula:

R. Sodii bicarbonatis, ʒiii.
Sodii boratis, ʒiii.
Extracti pini canadensis fluidi, fʒi.
Glycerini, fʒiv.
Aque q. s. ad. fʒviii.

M. et Sig.: To be diluted according to tolerance, adding one ounce to the pint or quart of warm water for use with the nasal douche.

With older children who can be taught the necessary manipulation, Warner's post-nasal douche should be substituted for the anterior douche of Thudicum on account of greater safety relative to the ear. The same solution in the same proportion can be used with it. One must first draw up a part of the liquid through the instrument into the rubber ball, then insert the curved nozzle through the mouth, behind the velum palati into the naso-pharynx, and squeeze the ball, thus expelling its contents forward through the nasal passages. This procedure should be repeated until half a pint of liquid is thus used, morning and evening. Children who will not tolerate any of these means can have the nostrils syringed conveniently by an ordinary soft rubber tipped ear syringe.

Peroxide of hydrogen has the property, by rapid oxidation, of disintegrating muco-purulent matter, and sprayed into the nostrils it will thus assist materially in loosening the dessicated secretion. It should be used a few minutes preceding the employment of either form of douche, sprayed by a powerful double-bulb atomizer, and of a strength just insufficient to cause smarting. The patient should receive treatment preferably from one to three times weekly in the office, at which time any resisting crusts should be detached by a cotton probang, and more actively stimulating and antiseptic medicaments applied. For the excoriation and incrustation around the anterior nares and over the cartilaginous septum, which is often one of the most annoying features with children, the following ointment thoroughly used each night, being inserted into the nostrils as far as the finger will reach, gives the most satisfactory results:

R. Hydrargyri oxidi flavi, gr. i
"Vaselin," ʒi.

M. et Sig.: For local application.

Sprays of "liquid vaselin" with which antiseptic and stimulating medicaments, such as thymol and menthol may be incorporated, are also serviceable at times, tending to retard crust formation. Cod liver oil and syrup of iodide of iron are seemingly the most useful internal remedies, although neither can be relied upon to the exclusion of local treatment.

NECROLOGY.

Thomas Antisell, M.D.

Appropriate action was taken by the Medical Society of the District of Columbia, and this sketch was ordered to be sent to THE JOURNAL OF THE AMERICAN MEDICAL ASSOCIATION.

SAMUEL S. ADAMS, M.D., *Recording Sec'y.*

Thomas Antisell, M.D., died in Washington, D. C., June 14, 1893. He was born in Dublin, Ireland, January 16, 1817. He was son of Christopher Antisell of Kings county, Ireland, a distinguished barrister and Queen's council; his ancestry going back to Sir Bertine Entwysse, who accompanied Henry II to Ireland.

He was educated at Trinity College, Dublin, studied medicine at the Dublin School of Medicine, Peter street, and Irish Apothecaries' Hall. He was a pupil and afterwards assistant to Sir Robert Kane from 1839 to 1843. He graduated at Royal College of Surgeons, London, in November, 1839, and spent a semester with J. B. Pelouze in his laboratory. In 1844 he pursued his chemic studies in Paris and Berlin under the most celebrated chemists of the time, Pelouze, Biot, Dumas and Berzelius. He practiced medicine in Dublin from 1845 until 1848, and was lecturer on chemistry in "Original School of Medicine." He was extra professor to Royal Dublin Society, 1845-1848. He was a member of the Royal College of Surgeons, England, member of the Royal Dublin Society and member of the Geological Society of Dublin. As one of the "Young Ireland Party" he was sentenced to exile and imprisonment, but a friend procuring for him a position as surgeon on an outgoing vessel, he sailed for the friendly shores of America. Landing at New York November 22, 1848, he began the practice of medicine in New York City, which he continued until 1854, when he accepted the invitation to become the geologist of the P. R. R. Survey on the thirty-second parallel, by Lieut. Parke, Topographical Engineer U. S. A. Made a geological reconnaissance of Southern California and Arizona Territory, published in the seventh volume of the United States Reports of Explorations and Surveys, 1856. In 1848 he was professor of chemistry in Berkshire Medical Institution, and in 1854 professor of chemistry at the medical college at Woodstock, Vt., and Pittsfield, Mass.

From 1856 to 1861 he was chemic examiner in the United States Patent office.

During the civil war, 1861 to 1865, he was brigade surgeon, Surgeon of U. S. Volunteers, medical director Twelfth Army Corps, surgeon in charge Harewood Hospital, Washington, D. C., surgeon in charge of sick and wounded officers in Washington, D. C., president of Board of Examiners for Surgeons and Assistant Surgeons of Volunteers, was "brevetted Lieut.-Colonel for faithful and meritorious services during the war." He was mustered out of service in October, 1865.

In 1865 he was offered the position of president of the College of Cairo, Egypt, which he declined. From 1866 to 1871 he was chief chemist to the U. S. Department of Agriculture, and in 1869-70 was professor of chemistry to Maryland Agricultural College. In 1871 he was invited by the