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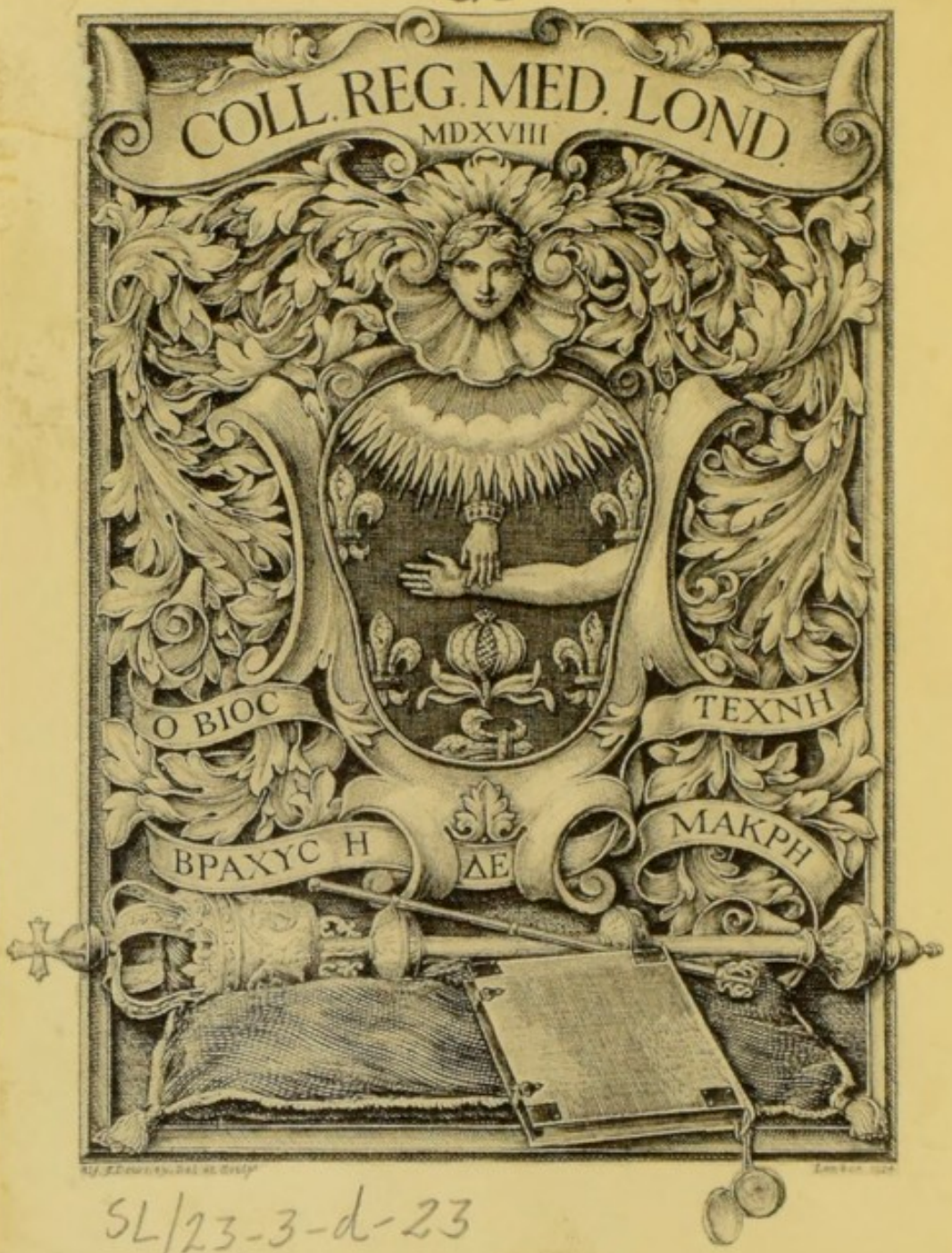
LETTSOMIAN LECTURES
ON
BRONCHIAL ASTHMA

THOROWGOOD



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The Lettsomian Lectures,

Delivered at the Medical Society of London, 1879,

ON

BRONCHIAL ASTHMA:

ITS

CAUSES, PATHOLOGY, AND TREATMENT.

BY

JOHN C. THOROWGOOD, M.D.Lond., F.R.C.P.,

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LONDON:

BAILLIÈRE, TINDALL, AND COX,

KING WILLIAM STREET, STRAND.

1879.

TO

ERASMUS WILSON, F.R.S., F.R.C.S.,

MEMBER OF COUNCIL AND PROFESSOR OF DERMATOLOGY

IN THE

ROYAL COLLEGE OF SURGEONS OF ENGLAND,

UNDER WHOSE AUSPICES, AS

PRESIDENT OF THE MEDICAL SOCIETY OF LONDON,

THESE LECTURES WERE DELIVERED,

THIS SMALL VOLUME IS MOST RESPECTFULLY INSCRIBED,

BY

THE AUTHOR.

PREFACE.

In accordance with the wish expressed by some of those who did me the honour to be present at my Lettsomian Lectures, I have now published these Lectures in this small volume. I have availed myself of the opportunity thus afforded me to enlarge upon some of the topics that I was constrained to notice briefly only in the Lectures as delivered. In the concluding Lecture, on the Treatment of Asthma, I have added some additional matter that seemed to me important and likely to prove useful to practitioners of medicine.

Welbeck Street, W.,
March, 1879.

ON

THE HISTORY AND NATURE

OF

BRONCHIAL ASTHMA.*

LECTURE I.

Mr. President and Gentlemen.—On unexpectedly receiving at your hands the honourable appointment of Lettsomian lecturer for the present year, my first thought naturally was as to the subject on which I might venture to address you with the prospect of being able to afford such information as would be of interest in its immediate delivery, and of practical utility hereafter.

Fifteen years' experience among patients at a hospital specially devoted to all forms of chest disease, ought, I considered, to supply material from which to make three lectures, each of which shall not exceed forty minutes in time of delivery; and I have accordingly taken as my subject a disorder of the breathing apparatus, which has long interested me much, and of which, as illustrated in a large number of cases, I possess numerous records. In choosing Bronchial Asthma as the subject for my three lectures, I purpose to speak, first, of the history, nature, and mode of production of this disorder, endeavouring

* Delivered before the Medical Society of London. Erasmus Wilson, F.R.S., President, in the chair.

thus to establish an accurate definition of the malady ; and then to set forth, discuss, and, as far as I can, explain the various and conflicting theories that have been propounded as to the seat and nature of the asthmatic spasm. Secondly, I shall have something to say regarding some special varieties of asthma, and then shall pass to the consideration of bronchial asthma as a secondary neurosis, with its pathological relations and affinities. The third and last lecture will be on the treatment of asthma for purposes of prevention, palliation, and cure.

In speaking of the history of asthma I must of necessity be brief, but it will not be without interest to trace the views held by some very pains-taking observers of old, who lived before the days of auscultation, and before the discovery of reflex and excito-motory movements. Modern research in experimental physiology, diagnosis, and pathology, has done great things in solving the causes of many kinds of dyspnœa formerly regarded as simple asthma ; but my own observation of cases and the study of books leaves me still in the belief that we have in our nosology, such a complaint as spasmodic bronchial asthma, an independent and essential disease, purely dynamic in nature, and not of necessity connected with any pathological lesion. Thoroughly typical examples of such an affection I believe are not so common as some may think, and the nature and seat of the spasm, which causes the dyspnœa, is a point very hotly disputed among highly competent observers, all of whom, however, stand apart from others, hardly less competent, who can meet with no case of asthma in which they fail to find some evidence of pathological change of tissue as the essential cause of all the symptoms.

I will now proceed to touch upon such points in the

history of asthma as will show by what steps we have been brought to our present state of knowledge of the disease.

Asthma, in the sense of dyspnœa, or difficult breathing, is said to have been described by Hippocrates, Galen, and Celsus. The last of these writers speaking of asthma, says :—

"Est etiam circa fauces malum, quod apud Græcos aluid aliudque nomen habet. Omne in difficultate spirandi consistit ; sed haec dum modica est, neque ex toto strangulat, δυσπνοια appelatur. Cum vehementior est, ut spirare aeger sine sono et anhelatione non possit ἆσθμα ; cum accessit id quoque, ne nisi recta cervice spiritūs trahatur ὄρθόπνοια."

From these lines we see that the Greeks, as quoted by Celsus, confined the term *asthma* to a difficulty of breathing, attended with sound, and more severe than the breath struggle called *dyspnœa*. Asthma seemed to imply a mean of breath difficulty, while dyspnœa and orthopnœa were terms applied to the two extremes. As knowledge and observation progressed, the intermittent character of the breath difficulty of asthma was duly observed and insisted on, and we find Boissier de Sauvages, in his Genera Morborum (1768) defining asthma as "Difficultas spirandi *periodice* recurrens, chronica."

We now know that the intermitting, or paroxysmal, character of a dyspnœa is not enough to mark it at once as spasmodic bronchial asthma. We find paroxysmal dyspnœa to be a sign of very different diseases ; it may be associated with grave pathological changes of incurable kind in organs other than the lungs, as, for, example, the brain, the heart, or the kidneys.

Sir John Floyer, wrote on asthma in 1698, and there are

copies of three editions of his work on asthma in the library of the Royal College of Physicians. One well-preserved copy of the second edition easily came to hand in our own library, thanks to the excellent way in which our library is now arranged and catalogued.

Floyer certainly recognised contraction of the bronchia as the cause of asthma. Like many others who have written on asthma, he was himself a great sufferer from the malady, and he often referred the chief seat of his distress to the diaphragm, which seemed to him rigid and spasmodically drawn up by some contractile force within the thorax, and this force he considered to be the air-tubes and lungs, contracted by an inflation of the membrane lining the chest, and covering the lungs.

The second edition of Sir John Floyer's work was published in the year 1717, and is dedicated to the learned and judicious physician, Dr. Phineas Fowke, of Wyrly Staffre. Allow me to refer to some of his statements and theories as indicating the condition of knowledge at that time :—

Says Floyer — "First, I shall observe that that is the most useful notion of asthma from whence we can take our indications for practice, and which is deduced from an exact and full sensible history of the disease." He then continues—"I have assigned the immediate cause of the asthma to the straitness, compression, or constriction of the bronchia ; and in the continued asthma the causes must be constant, as dropsy, tuberculum, &c. The return of periodic asthma depends on the defluxion of humours on the primæ viæ. Thus, the old notion of the asthma being a defluxion of serous humours is certainly true because evident to our senses in the evacuation of serosities."

"Some,' continues Floyer (p. 43), "express their feeling during a fit of asthma, as if the lungs rose, and were drawn upwards to choak them. Contraction of the vesiculæ is very probable, because the bronchia are contracted, and the vesiculæ have the same muscular fibres to help expiration, by which they may be drawn so up as not to admit the air."

The motion of the chest and lungs Floyer ingeniously compares to that of a bellows. "We can," says he "move the bellows easily, but suppose a bladder tied within the bellows over the nozzle, so as to receive the air, and suffe none to get into the cavity of the bellows, it will follow that in a perfect stoppage of all the entrances of air the bellows could not be opened, and if no more entered than may be contained in the bladder the bellows would be opened but a little way, and would inspire difficultly. So it appears in the business of the asthma, the inspiration is difficult and laborious, because but little air can be admitted into the contracted bronchia, and the vesiculæ drawn up. This puts the scapular and intercostal muscles and diaphragm upon a violent endeavour to press in the air and open the lungs, which nisus authors have mistaken, and supposed the pneumonic muscles, especially the diaphragm, to be convulsively affected ; but it may easily be apprehended that the diaphragm cannot press the viscera downwards to enlarge the breast if the air cannot be admitted into the lungs to follow its depression, and fill the cavity of the breast ; and this is the true reason why the diaphragm cannot move in the asthmatic fit. The contraction and stiffness of the lungs during asthma causes a catalepsis or rigidity of the diaphragm—the part most unjustly accused of this tyrannic oppression."

Thus we see that Floyer, while fully cognisant of the

rigid state of the diaphragm during a fit of asthma, does not agree with those of the present day who, like Wintrich, Bamberger, and Lehmann, believe a tonic spasm of the diaphragm to be the essential cause of asthma. Floyer considered the wheezing noise in expiration during asthma to be due to contraction of the muscular fibres of the bronchi. That this symptom is not due to phlegm in the tubes, he says, is evident, because the hysteric, who have no phlegm, wheeze much.

Floyer was in error in assuming the presence of muscular fibre in the wall of the pulmonary vesicle. The small bronchi are muscular and elastic—the cells are elastic but not muscular. What Floyer meant by inflation of the membranes around the lungs by humours as a cause of bronchial contraction I do not clearly comprehend; but that he regarded the contraction as brought about by mechanical pressure rather than by nervous influence seems clear from his saying that certain writers of his day, Van Helmont and Dr. Willis, were wrong in regarding asthma as a convulsion, to be treated by antispasmodics, hot tinctures, gums, volatile salts and sulphur medicines. The proper treatment is by evacuants, and remedies calculated to promote secretion and effect the discharge of humours.

Passing on from Floyer to Dr. William Cullen, the distinguished nosologist of Edinburgh, we find him, in his "Synopsis Nosologiæ Methodicæ, published in 1772, defining asthma as "Spirandi difficultas, cum angustiæ in pectore sousu, *per intervalla* subiens." Cullen appears to have regarded spasmodic asthma as essentially due to constriction of the bronchial muscles, and in his nosology he divides asthma into three groups.

First—Idiopathic asthma, of which kind he enumerates eight varieties.

Second—Symptomatic asthma, two varieties, viz., 1, Asthma arthriticum ; 2, Asthma venereum.

Third—Comes a long list of asthmas, dyspnœas and orthopnœas symptomatic of cardiac and pulmonary difficulties and obstructions.

The belief held by Floyer and Cullen that the spasm of bronchial asthma was due to contraction of the smaller bronchial tubes receives plenty of support in the present day. Our late distinguished Fellow, Dr. Hyde Salter, has expressed himself strongly and decidedly as an upholder of the bronchial constriction theory, and among other celebrated men of the same way of thinking I may name Trousseau, Romberg, Bergson, Biermer, Théry, Williams, Walshe, Fuller, Watson, Radclyffe Hall, Gerlach, MacGillivray, and others.

Sir Thomas Watson describes asthma as a difficulty of breathing occurring in paroxysms, and accompanied by loud wheezing sounds "in the respiration ; going off after some hours, with more or less mucous expectoration, and unattended by fever. And these paroxysms of dyspnœa are believed to depend upon a spasmodic constriction of the bronchial tubes."

There comes next to be noticed, in the history of the growth of our knowledge of asthma, the theory put forward, and ingeniously supported, by Dr. Robert Bree in 1801. Dr. Bree, when in considerable practice as a physician at Leicester, was attacked so severely by paroxysms of asthma that in 1793 he felt compelled to abandon his profession and accept a commission as captain in a regiment of militia. Under these altered conditions of life Dr. Bree lost his asthma, to return, however, some years later

with great severity, rendering the latter portion of his life a period of constant suffering, and at times of the most agonising distress. In 1796 Dr. Bree resumed the practice of his profession in Birmingham, and while there he published his treatise, entitled "A Practical Inquiry into Disordered Respiration, distinguishing the species of Convulsive Asthma, their causes and indications of cure." This work reached a fifth edition, and conferred upon its author a very high reputation, while it brought him also considerable practice. In 1833 Dr. Bree died at his house in Park Square, Regent's Park, at the advanced age of 80 years. The great point in Dr. Bree's theory of the cause of the asthmatic paroxysm was the presence in the air tubes of some peccant irritating matter which excited the lungs powerfully to effect its discharge. When by the expulsive efforts of expectoration the peccant mucus was thrown off then the spasm in the air tubes came to an end; the desired object having been attained in the expulsion of the mucus. Dr. Bree had observed carefully the facts of an asthmatic paroxysm, but had not correctly interpreted these facts; for, as Salter has well shown, during the asthmatic fit the power of discharge from the lungs by cough is quite in abeyance. Moreover, I hope, as I proceed, to show that the collected mucus is the effect, and not the cause, of the asthmatic spasm.

He who, in the present day, is the nearest exponent of Dr. Bree's theory is Leyden. This observer found in the viscid grey mucus, expectorated on the subsidence of a fit of asthma, brownish masses of cells undergoing granular degeneration, and among these could be made out colourless octahedral crystals, soluble in hot water, and in acids and alkalies, but not in ether, and consisting probably of a substance analogous to mucine. Leyden

believes that these sharp crystals irritate the peripheral extremities of the vagus nerve, and produce reflex spasm of the bronchial muscle.

Attempts to prove the connection by experiment appear to have failed, and the presence of these angular crystals is not peculiar to the sputum of asthma, for similar crystals have been found in the expectoration of persons suffering with ordinary catarrh and croupous bronchitis. Leyden possessed the knowledge of reflex nervous spasm, unknown in the time when Dr. Bree wrote; and, I needly hardly say before this Society, that it is to the discovery of excito-motory and reflex nervous action, as well as of auscultation by the stethoscope, that we now owe so much of our knowledge of the true nature and definite varieties of asthma.

Persistent mechanical irritation of the air-tubes by the inhalation of various kinds of dust will produce irritability, swelling, and various degrees of thickening in the lining membrane of these tubes; but asthmatic paroxysms are by no means a constant accompaniment of these pathological conditions.

Workers at dusty employments, mill-stone dressers, knife grinders, and chaff cutters, get their lungs greatly irritated by the dust and fine steel particles they inhale while at work, and the effect is very obstinate chronic bronchitis. Asthmatic paroxysms may co-exist, but such co-existence is certainly not an invariable rule, and depends on the presence or absence of a neurotic or spasmodic element in the case. In six cases of mechanical bronchitis, detailed by Dr. Headlam Greenhow, I find no mention of distinct asthmatic attacks. The tendency of the disease was towards change of structure, rather than to nervous spasm. The trustworthy authority

just quoted, in speaking of the asthmatic complications of the so-called "dry catarrh" of Laennec, attributes the dyspnœa partly to narrowing of the bronchi by swelling of their lining mucous membrane, and partly also to spasm of these tubes. That irritation leading to local congestion of the pulmonary mucous surfaces may become the cause of an acute attack of dyspnœa I do not doubt; but before entering further upon this question, I wish to place before you the reasons that make me uphold the doctrine of the existence of an essential independent spasmodic bronchial asthma, dynamic in nature and symptomatic only of some great nervous perturbation in the system; at times centric and emotional, at other times reflex, in its mode of origin, capable, too, of artificial production by direct irritation applied to the trunk of the vagus nerve.

The reasons that have prevailed to establish and maintain in my mind the conviction that we can have a severe spasmodic dyspnœa of purely nervous origin may be divided into two groups—

First—The evidence adduced from observation of cases as regards causation and cure;

Second—The support given by experimental physiology to the belief in nervous spasm as the cause of bronchial constriction.

My own observation has shown me that a most severe fit of bronchial asthma, requiring the inhalation of chloroform for its relief, may develope in the space of two minutes. In another case, a youth going up for examination at Burlington House is breathing with comfort, when the anxiety due to the non-arrival of the carriage to convey him to the place of examination causes

a speedy attack of asthma, which subsides as the carriage draws up at the door.

Dr. Chowne reported a case where a dash of cold water over the foot invariably and immediately induced a paroxysm of asthma in a gentleman 50 years old. Dr. Salter affirms that he has seen severe asthma developed in as short a time as thirty seconds.

In 1834 John Ross reported a sudden and severe paroxysm of asthma, brought on by the smell of a parcel of new feathers.

The late distinguished French physician, Trousseau, who was the subject of inherited asthma, used to relate how the worst attack of asthma he ever experienced came on in the course of a few minutes, with intense dyspnœa and oppression, relieved, however, in eight or ten minutes by smoking a cigar. Trousseau was at the time of his seizure up in the hay-loft watching his coachman, whom he suspected of dishonesty, measuring oats, and he attributed his severe attack to emotional agitation. "It could not have been the dust of the oats," says Trousseau, "for I have often been exposed to far more dust, and yet had no asthma." The profuse running from the eyes and nose, however, that Trousseau had make me think his seizure was a sort of catarrhal asthma due to inhaling dry pollen in the oat dust; this might have caused the profuse coryza; the asthma, doubtless, was emotional and spasmodic.

Trousseau gives a good example of the nervous nature of asthma in the case of the brother of the Chancellor of the Chamber of Peers in Paris, who used to free himself at once from his difficult breathing by having four or five bright lights brought into his apartment. A bad asthmatic, whom I have known for years, declares to me

that the contemplation of himself in a looking-glass constantly gives relief to some of his worst attacks. With some the mere presence of a cat, a dog, or a hare-skin, in a room, at once brings on asthma.

Walshe gives a striking instance of asthma occurring as a primary neurosis of emotional, or centric, origin in the case of a man, very liable to spasmodic asthma, who always carried in his pocket some cigarettes made of belladonna and stramonium. One day, at a distance from home, he suddenly found he had forgotten his cigarettes. Instantly he had a violent paroxysm of asthma.

Salter has noticed asthmatic seizures to alternate with those of epilepsy ; and Eulenberg has seen paroxysmal breath seizures occur in alternation with hemicrania and angina pectoris.

The great relief to the asthmatic fit often obtained by the inhalation of the fumes of tobacco, stramonium, and belladonna, and the speedy way in which chloroform vapour dissipates the spasm, further support the belief in the neurotic character of the seizure ; and the more the nervous spasm predominates, the more certain is the relief obtained by the use of the above-named agents—a point I hope to work out satisfactorily when I come to the matter of therapeutics in my third lecture.

Observations that I have had opportunities of recording have shown that there is no rise of body temperature during a night of intensely severe asthma, brought on by nervous excitement. Such are a few of the facts that make me think we must admit into our nosology bronchial asthma as an essential primary neurosis. Now comes group of evidence No. 2, based on physiological experiment, as well as on clinical observation ; and here I approach the question so warmly contested just now, as to what part of the

respiratory mechanism is the seat of the nervous spasm. Let us look first at the result of experiment. We find in the very smallest bronchial tubes a distinct layer of smooth muscular fibres disposed between an external and internal layer of elastic fibres. These elastic fibres support the borders and angles where several alveoli meet, and they are further distributed in a retiform manner over the alveoli of the lung. This membranous wall of the air cell according to Stricker, is entirely devoid of all trace of muscular fibre, and the air cells were found by Dr. Williams, in 1841, to possess little contractile force under the influence of galvanic or chemical excitation, though the lung by its elasticity is capable of contracting generally to about one-third of its ordinary bulk when the thorax is opened.

The contractility of the muscular element in the small bronchial tubes under the influence of mechanical, chemical, and electrical stimulants was ingeniously demonstrated by Dr. C. J. B. Williams as long ago as 1840. Afterwards, Longet and Volckmann showed that irritation of the vagus nerve would produce contraction of the lung, or rather of the bronchial muscle. The last of these observers, saw the lung contract, when the vagus was irritated, with force sufficient to blow out a candle. Paul Bert, Gerlach, and more recently Dr. H. MacGillivray, have confirmed these results, so that, as Riegel, one of the most recent writers on asthma, says, "It is therefore now no longer doubtful that the bronchial muscles can be excited to tonic contraction under the influence of the vagus nerve."

Biermer thinks that the bronchial muscle in a spasmodic state may form a sphincter-like occlusion more readily overcome in inspiration than in expiration, and that thus the escape of air from the pulmonary alveoli is impeded. The expected result of this state of things would

be over-distension of the air cell and ultimate production of emphysema, and this is what we may often observe actually to occur. Recent observations by Paul Bert tend to show that arrest of respiration can take place in that phase of the respiratory act during which the nerve irritation is applied, and a more powerful nerve excitation is required to produce stasis in inspiration than in expiration. Bert has also demonstrated, as Williams had done before, that after excessive inflation of the lung the bronchial muscle could not be excited to contract; but Williams observed that on waiting a minute or two contraction took place, only diminished in degree by the compressed state of the air, which required more contractile force to move it. I quote the original paper of Dr. Williams, kindly placed at my disposal by Dr. Theodore Williams.

Let us now proceed to inquire how far the results of experiment accord with observed clinical facts.

The musical wheezings heard in the air-tubes of a person during a fit of asthma are, as Salter says, positive evidence of bronchial contraction, and the sudden way in which these wheezy sounds may shift from one part of the chest to another is proof that the contraction is spasmodic, and not due to mucous congestion or œdema. "Thus," says Salter, "we see by evidence as certain as sight, that in asthma bronchial spasm must, and does, exist, and that no other conceivable supposition will explain the phenomena." I myself, when considering the causation of asthma some time ago, got the idea that if the lung be contracted air must be squeezed out of it like water from a sponge, and that then we ought to have impaired chest resonance on percussion. Desirous as I then was to demonstrate such loss of resonance, I found it to be the

exception rather than the rule. Turning to the books, I find that Dr. Walshe, in his fourth edition (p. 548), says: "The gradual evacuation of the supplementary, and in some measure even of the residual, air which takes place in both lungs during the fit of asthma, slightly impairs the resonance on percussion." "This," says Dr. Walshe, "I repeatedly ascertained in a girl named Harmer, a hospital patient; but, on the whole, this sign is rarely to be established." Investigations of my own, with special reference to this question of impaired chest resonance during the asthmatic fit, make me agree with Dr. Walshe as to the sign being a rare one. The elastic wall of the pulmonary air-cell need not of necessity contract under the same influences that may determine a spasmodic stricture of the bronchial muscle. Remember the observation of Biermer, already noticed, as to how the bronchial muscle may form a sort of sphincter round the opening of the air-cell, and then we shall see that the simile, wherein the asthmatic lung is likened to a squeezed sponge, is not absolutely a correct one. I can understand how, as a result of contraction of the bronchial muscle, inspiration and expiration may both be impeded and imperfect. Generally, according to observation, and recent experiments of McGillivray, the expiratory act is the one specially impeded, the result of such impediment being over-distension of the air-cells, and the gradual development of emphysema. This over-distension of the air-ceils will also add to the cause of the tightness felt in the upper thorax, and will be the cause of the tympanitic, bandbox-like note elicited by percussing the chest wall. Lately a good deal has been said as to the inspiratory or expiratory character of the dyspnœa during a fit of spasmodic bronchial asthma, and this is a question well worthy of study in its bearing on certain modifica-

tions of the asthmatic paroxysm, as I hope shortly to show you. To me it appears that both respiratory acts are impeded more or less; sometimes inspiratory difficulty is most urgent, at other times, and in other cases, expiratory effort is pronounced and unmistakeable. My own reports of cases show me one group of patients who unhesitatingly refer their breath difficulty to the act of inspiration; others, among whom I am sorry to have to place an eminent member of our profession in a northern town, say that their sufferings during the paroxysm of asthma are so intense that they hardly can tell whether inspiration or expiration is most laborious. A third group, to be treated of more fully in another lecture, often spontaneously affirm that the desire they have is to get the air out of the chest rather than to get it in.

In proportion, generally, as lung emphysema is developed, so does the expiratory dyspnœa obtain the ascendancy. In young persons, where spasm is marked without much emphysema, inspiratory dyspnœa is often most severe and distressing; and not long since I saw in the case of a middle-aged man, who had long been afflicted with most severe attacks of almost asphyxiating asthma, a good example of inspiratory dyspnœa. "Decidedly," said he, "my difficulty is in inspiring."

In this case I observed thoracic distension was in no way marked, and on listening to his chest six hours after one of his very bad attacks, I could hear no sibilant expiratory wheezings, and expiration seemed free. I further noticed that the percussion resonance did not come up to the normal standard of clearness, and this imperfect resonance of chest after a fit was remarked on by the patient himself. I have been struck with the fact, just exemplified, that on examining the chests of patients of the class

described, where inspiratory distress is intense, and chest distension by no means marked, I have failed on the day following a bad night of asthma, to find about the chest any of that prolonged sonoro-sibilant expiration with which we are so familiar when we listen to the chest of an asthmatic shortly after his fit. Another point I have investigated, is the position of the diaphragm in these cases, and have found it to be drawn up rather than pressed down. The shoulders of the patient are nearly always high, for the thorax is drawn powerfully up by the muscles of inspiration. The normal movement of the ribs outwards and forwards does not take place, so that true divergence of ribs and expansion movement is not appreciated by the applied fingers. I purpose soon, after I have read the notes of a case, to return more fully to these points ; meantime I would observe how a great inspiratory effort can be made by drawing up of the thorax in the way just described ; and also how a similar effort can be made of a more abdominal character, in the performance of which the diaphragm descends and the abdomen protrudes, but in this last effort the lung must be fully expanded, and if dyspnœa occur it will be more of an expiratory than of an inspiratory character.

I certainly think that either of these conditions of thorax and abdomen may obtain in cases of asthma. In each case the muscles of inspiration act to aid the elastic resilience of the chest wall, which Dr. Douglas Powell has so cleverly demonstrated as the active force of ordinary tranquil inspiration. The embarrassed breathing and asthma are due to want of corresponding action between the lungs and the thorax. The lungs are in arrest of action, and in the first case, where chest and diaphragm are drawn up, the air is in a great measure evacuated from the lower part of

the lungs, and is kept out by the bronchial stricture ; hence the straining inspiratory effort, while the pulmonary spasm causes a sense of tightness or tearing in the upper chest, and here, indeed, air may be held pressed into the apices of the lungs, just as it is pressed into these parts by the violent expiratory efforts of coughing. In the other case where the diaphragm is down, and chest over-full with air, we get very prolonged expiratory wheezings, the bronchial spasm retarding expiration. As I have said, I shall hope shortly to follow these views a little further ; being desirous now of placing them as simply as I can, I make no reference to imperfect aeration of blood in the lungs as a possible cause of determining, in a reflex way, powerful inspiratory efforts ; and speaking of inspiratory difficulty, I of course exclude all laryngeal or tracheal disease in the way of congestion or chronic stenosis of these parts. I have endeavoured by an analysis of the notes of a number of cases to illustrate the varying conditions of the chest and abdomen during the asthmatic fit, and thus to explain how it is that authors differ so decidedly in the descriptions they give of the state of the thorax during such fit.

This same impression of want of unanimity of description seems to have been made on the mind of Dr. Berkart, the most recent writer on asthma, and he has placed the various descriptions so well together that I cannot do better than quote them just as they are given, with the authorities.

Respiration retarded to from 9 to 7 per minute.— Salter, 77.	Respiration augmented to 40, 60, or 80 per minute.— Caustatt, Ferrus, Wunderlich (J. C. Thorowgood).

The lungs are unusually collapsed within the thoracic cavity, and the parietes drawn in.—Williams, 91.

The chest remains distended, its walls are kept fixed in the extreme inspiratory position, such enlargement involving all the diameters of the thorax.—Salter, 76.

Inspiration is difficult; expiration, short, easy, superficial.—Bergson.

Expiration mainly is impeded, the patient labours 4 to 5 seconds to empty his chest.—Biermer.

Thorax sounds dull on percussion.—Williams.

Percussion induces a hyperresonant note.—Biermer.

While inspiration (Ziemssen, iv., 562) shows nothing that varies from an ordinary powerful and somewhat forced effort, expiration presents the picture of a most laborious and tormenting, and, at the same time, fruitless struggle. —Bamberger.

Inspiration is violent and painfully ineffective ; expiration is much prolonged, but unaccompanied with notable anguish.—Walshe.

Some observers, I find, speak of the abdomen as distended, others, as retracted ; the fact being, as I take it, that sometimes one condition, sometimes the other obtains.

I remember, some ten or twelve years ago, when first my interest in the nature of the asthmatic paroxysm was aroused, thinking that sufficient attention had not been paid to the part taken by the diaphragm in the mechanism of asthma. That this muscle is much concerned in the dyspnœa of old emphysematous persons, I fully believe, but I cannot agree with Wintrich and Bamberger, who deny the influence of bronchial stricture in producing

asthma, and attribute the seizure to tonic spasm of the diaphragm. True diaphragmatic spasm is seen best in some forms of hysteria, and it is marked by short hurried inspiration, short pause and rapid expiration. In a case of this description, shown to me by my clinical assistant, Mr. MacDonald, the respirations were as many as 80 in the minute, a short quick movement at the epigastrium was observed; auscultation revealed no abnormal sound. The patient was a young woman, and had had similar attacks before during the last few years. Bamberger believes, with Wintrich, that with a depressed position of the diaphragm there can be no bronchial stricture. Wintrich, moreover, says it is impossible to explain the enlargement of the lungs with increased air contents by a spasmodic contraction of the bronchial muscles. Bamberger further says that bronchial spasm is in the highest degree improbable, if not unimaginable, for in such case inspiration and expiration, especially the former, must be laborious and prolonged. Against these statements we have the fact, testified by several highly competent to judge, that inspiration and expiration in asthma are both very laborious acts; and we find Biermer stating, most correctly as I think, that a depressed condition of the diaphragm and acute pulmonary distension are quite compatible with bronchial spasm.

Acute pulmonary dilatation follows on acute obstruction, just as chronic pulmonary dilatation and emphysema follow on obstruction of air-tubes by old bronchial catarrh. (543, Ziemssen.)

Before I had an opportunity of studying the observations of the writers just quoted, I had given up my idea of diaphragmatic spasm as a cause of asthma, while I came to think that a kind of inertia, or partial paralysis, of the

diaphragm, may have a good deal to do with the expiratory dyspnœa of old emphysematous persons.

From what I have observed in cases of spasmodic asthma coming on very suddenly, and sometimes brought on by some great expiratory effort, such as a fit of violent coughing or laughing, it seems that the thorax is drawn up and fixed; but, on looking at the lower part of the thorax, quick, short, and very limited movement of the diaphragm and lower ribs may be observed, by which respiration is kept going and life maintained. The distress in these kind of cases, often met with in young persons, is markedly spasmodic and most severe, so that chloroform inhalation is often the only agent that gives effectual relief.

Allow me here to read before you my record of a typical case of this form of asthma :—

A young man in good health had his first attack of asthma take him quite suddenly after a fit of excessive laughter. Here was an example of spasmodic arrest of breathing after a complete expiration. On another occasion I saw this youth pass, in the course of two minutes, from sudden exposure to cold to the surface, into an intense and even alarming paroxysm of asthma, and during this seizure I noticed the state of the chest. There was great drawing up of clavicles and thorax, with fixation of these parts. The abdomen, at xiphoid cartilage, was powerfully retracted, and the diaphragm elevated. Respiration counted 64 per minute ; pulse, 110, very small. The breathing act seemed carried on by a slight, rapid, and very limited movement of the diaphragm and lower ribs. There was no laryngeal difficulty ; chest resonance, deficient in clearness ; expiration, wheezy, jerky, and prolonged ; inspiration, short, and quickly followed by inspiration. The inhalation of chloroform soon gave relief to

the spasm, and the patient was released from his fixed bent position over a table which he assumed on the fit taking him.

This young man found, like many other cases that I have observed, that when he was able to cough and get up some mucus he felt better, and a pill of pil. hydrargyri and pulvis scillæ gave notable relief, apparently by promoting expectoration. Dr. Bree would explain this by saying "your pill fetches up the irritating mucus from the lungs, and so does good to the asthma;" others would very reasonably attribute the benefit derived from the pill to its relieving congestion of the bronchial mucous membrane. Against the exclusive truth of the theory of congested mucous membrane as the sole cause of dyspnœa, I would urge that the congestion and subsequent mucus flux result from the pressure put upon the capillary vessels by the spasm of the bronchial muscles. The great suddenness of the invasion of asthmatic dyspnœa, compelling the patient to leap from his bed and rush to the open window, and the speedy relief often afforded by inhaling the vapour of ether, or chloroform, or the smoke of burning tobacco or stramonium, point to nervous spasm rather than to acute congestion. The spasmodic constriction of the bronchial muscle induces stasis of circulation and congestion, and if flux and secretion can be determined, the patient feels much relief. Thus, I have often observed the spasm of asthma to subside when bronchitis comes on and causes free secretion; and people say, "When I get bronchitis my asthma goes away." In the essential dynamic form of bronchial asthma, as illustrated in the case the notes of which I have just read, there is, to all appearance, as well as on the emphatic declaration of the patient, marked inspiratory dyspnœa. Seeing how often these intense fits of

bronchial spasm follow on an exhaustive expiratory effort, one can comprehend the inspiratory character of the breath difficulty. Previous expiration has pumped the air out of the lower part of the lungs and forced some up into the apices, just as we see in the expiratory effort of coughing; here this air is held, for the thorax is raised and drawn up in powerful inspiratory effort, and the tension in the upper chest becomes very distressing; meantime, the retracted condition of the lower part of the lung causes the diaphragm to rise up with the thorax. Patients under the influence of this typical form of bronchial spasm have volunteered to me the statement that they feel as if their lungs were drawn up—drawn up to choke them, as Floyer used to say. A young man described his fit to me also in these words: "Cold air seems to draw together and contract my air-tubes, and then I pass into one of my bad fits;" and the fits in this case were as intense as any I have met with, setting at defiance the best-planned remedies of numerous physicians. It is in the young we often see these very severe attacks of bronchial spasm. Dr. Fuller says that the most frightful paroxysm of asthma he ever saw was in a child, æt. 13. Salter describes an alarming attack in an infant not 2 years old, and I expect not uncommonly the bad pulmonary attacks of infants during dentition, if carefully investigated, would be found to have more of the element of spasm than of inflammation about them. The drawing up of the diaphragm was well exemplified in the instance of an asthmatic little boy who used to gasp out, "See how hollow I am," as he pointed to his retracted epigastrium. With respect to this elevation of the diaphragm, I find that Wood, of Philadelphia, describing a fit of asthma, says: "A hollow in the epigastrium is produced by the unusual elevation

of the diaphragm, while expiration is much less difficult than inspiration." Walshe, too, already quoted, says: "Efforts at inspiration, convulsively violent and painfully ineffective, are accompanied, in the purely dynamic form of the disease, with sinking of the epigastrium, falling in of the lower part of the sternum, and elevation of the diaphragm. Expiration in these cases is prolonged, but unaccompanied by notable anguish."—(546, 4th edition.)

In these cases of asthma in young persons not due to whooping-cough or antecedent bronchitis, and very prone to come on after an expiratory effort, the prognosis should be favourable, for, though inspiratory spasm is alarming, with great sensation of internal constriction or cramp within the chest, yet the chance of co-existing emphysema is not great, and we may see in impairment of percussion, resonance, elevation of diaphragm, and absence of excessive chest distension, evidence on which to found a hopeful prognosis.

The fact that young people do grow out of this uncomplicated spasmodic asthma, or, better still, perhaps, that they can be cured of it, if it be due to some reflex irritation—as worms in the bowels, or enlarged bronchial or tracheal glands in the chest—shows that no high degree of emphysema can have been produced. "The asthma of children, says Riegel, often ceases spontaneously after a short time, or else at the period of puberty." (Ziemssen iv., 566.)

The theory of Lebert that the spasm beginning in the bronchial muscles, and thus narrowing the tubes, causes a great excess of inspiratory effort to force the air through the constricted bronchi, and then that this increased respiratory stimulus, reflected to the medulla and respiratory centres, induces reflex spasm of the diaphragm

through the agency of the phrenic nerve, is ingenious and worthy of notice. The theory appears to accord with the fact that we see cases of what I call ingravescent or culminating asthma, slight at first, but getting gradually worse; want of air increases till an actual state bordering on true apnœa is produced; then come on most violent inspiratory efforts, and every auxiliary muscle is called into violent action. The power of these extreme inspiratory efforts was demonstrated by the experiments on asphyxia made before the Royal Medico-Chirurgical Society a few years ago. These facts show how wise it is to try and cut the asthmatic fit short *in initio* by anti-spasmodic inhalation in the early stage.

The theory of Weber and Störck, already casually referred to, that asthma is due to tumefaction of the bronchial mucous membrane in consequence of dilatation of the blood-vessels by vaso-motor nervous influence, is full of interest and importance, especially in connection with certain varieties of asthma and catarrh, to be treated of in Lecture II. Störck says he has seen the mucous membrane of the larynx, trachea, and right bronchus in a state of hyperæmia during an attack of asthma. To see as much as this in the windpipe of an asthmatic during his fit reflects credit on the patience and perseverance of observer and observed, and I am inclined to think that anyone who can manage to keep the laryngeal mirror at the throat of an asthmatic for but a short time will be pretty sure to obtain evidence of congestive hyperæmia. Be this as it may, there is the oft-made complaint of asthmatics of tightness and obstruction in the nose, the tendency often to profuse nasal flux, and the liability at times to the formation of mucous polypi in the nasal passages, all pointing to a congestive hyperæmia of these parts.

My reasons for believing the congestive hyperæmia and flux to be secondary effects of nervous spasm have been already set forth. Biermer, whose views on the nature of asthma seem to be fully in accord with the results of experiments and the observation of clinical facts, and who, like myself, is a supporter of the bronchial spasm theory, regards a fluxionary hyperæmia of the bronchial mucous membrane as quite a possible cause of asthma. (Ziemssen, 550.)

I agree in this, as in most other points, with the excellent observer just named, and, in considering the therapeutics of asthma, it is well to be mindful of the condition of bronchial hyperæmia, be it primary or secondary. Furthermore, it is of moment in therapeutics to recognise whether the disease be inspiratory or expiratory in rhythm.

Mr. President and Gentlemen, I must not encroach further on your kind attention this evening. The attempt to fulfil the conditions I set forth at the beginning of my lecture has not been so easy as I had anticipated, and I have been carried to a greater length in discoursing of the various theories of asthma than I had originally intended. I feel, however, bound to place fairly in review before you the more prominent of these theories as now taught and upheld by their several promulgators.

I will now conclude, and shall hope, in my next lecture, before proceeding to the pathological part of the question, to follow out a little further the subject of bronchial hyperæmia, congestion, and flux, in connection with certain interesting varieties of asthma, the prominent place among which will be assigned to hay asthma, or summer catarrh.

LECTURE II.

BRONCHIAL CONGESTION, AND THE PATHOLOGICAL RELATIONS OF ASTHMA.

In my last lecture I placed before you the most prominent theories that have been advanced in explanation of the phenomena attendant on a fit of spasmodic bronchial asthma. I sought to make clear, from experimental and clinical evidence, the reasons that support my belief in the neurotic or spasmodic nature of the breath stoppage; and then I discussed the question of the seat of this spasm, showing that most of those, who, for the last century, have given their attention to asthma, believe the spasm mainly to affect the smooth muscular coat of the bronchial tubes. The part taken by the diaphragm in the mechanism of asthma was also considered, and I endeavoured to prove that the condition of this important muscular structure during a fit of asthma, with respect to elevation or depression, is not a constant one, but sometimes it may be elevated, sometimes depressed, according to the nature and rhythm of the respiratory effort. The cases where the diaphragm is raised, and the epigastrium retracted, appeared to be most common in young persons, and in hysterical subjects, where inspiratory dyspnœa was marked, where no great degree of emphysema was developed, and where the asthma was often excited by some powerful expiratory effort, as, for example, a great

fit of coughing or laughing. The cases where the abdomen protruded, and the diaphragm was depressed, were usually those of persons who had more or less emphysema of lung, whose chests were over-filled with air, and whose respiratory difficulty was rather in expiration than in inspiration. In the recognition of these features, I looked to find some explanation of the contradictory statements of many authorities as to the condition of the thorax and lungs during a fit of asthma. How far I have succeeded in establishing the truth of what I have advanced, I will not stay to inquire ; but I think we must all agree that the subject is one on which, in our present state of knowledge, some difference of opinion must be allowed, and we must not expect the term, asthma, to comprehend a complete uniform train of symptoms. No wonder, when we reflect on the complex nature of the respiratory process, and the various forces and conditions involved in its performance.

We now pass from the nervous and muscular elements of the asthmatic fit to enter more fully on the vascular element : on congestion of the air tubes as a producer of severe dyspnœa. I have already put before you the theory, very lately propounded by Weber, in the form of a supposition of tumefaction of the mucous membrane of the bronchi in consequence of dilatation of the blood vessels through vaso-motor nervous influence. This idea of rapid congestion causing serious dyspnœa does not lack support. There are those who appear to regard it as the exclusive cause of asthma—at least, so I judge from some of the statements I find put forth by writers. Professor Sée, of Paris, for example, in a very interesting paper in the *Practitioner*, on the " Use of Belladonna in Asthma," concludes with these words : " We need not concern

ourselves with the bronchial muscles, as it is well understood at the present day (1869) that they play no part in the production of asthma." The last time I ever saw Dr. Hyde Salter smile was when I read to him these remarkable words of the French professor; but Salter said he was aware a similar opinion had been expressed by others who had spoken in a way yet more emphatic, and by no means complimentary to the upholders of the doctrine of bronchial spasm.

Weber, who appears the original propounder of this bronchial congestion theory, is far from denying bronchial spasm as a factor in the asthmatic fit; and Biermer, whose rational and clear views it is a pleasure and satisfaction to study, attributes a certain *rôle* to the fluxionary element in bronchial asthma, while he also supports the doctrine of tonic bronchial spasm.

In old days we know that a distinction was drawn between dry and humoral asthma; and now-a-days we seek to make this differentiation more evident, and to place it on a sound basis. Purely nervous asthma of reflex origin, as, for example, hysterical asthma (and you may remember how I quoted from Floyer's old book the words, "that the hysteric who wheeze much have no phlegm"), I believe to be independent of congestion and due purely to spasm; while on the other hand, there must be admitted to exist a class of cases where congestion, hyperæmia, and mucous flux are undoubtedly found playing a very important part in causing dyspnœa, and guiding us, moreover, materially as to our method of treatment.

I may just instance the congestive bronchitis and dyspnœa of cardiac disease. The gasping and orthopnœa of the state that we call cardiac asthma, may be due

entirely to bronchial congestion, and I have seen, as others present also must have seen, cases of this description of congestive asthma who have been thoughtlessly told to smoke tobacco and stramonium, and who come and tell us that the smoking makes them worse, and to feel as if they would die in a faint. We may get at times attacks of muscular spasm in these cases, caused by the vascular congestion disturbing the rhythmical action of the bronchial muscle, and only then is it that anti-spasmodics may be temporarily needed. Salter was very strong on the sympathy of the bronchial muscle with the irritated mucous membrane, and went even so far as to express his "belief that severe chronic bronchitis never exists without asthmatic complication;" a belief in which I am far from agreeing with my late valued friend.

I pass, for a time, from the consideration of bronchial spasm caused by the inflamed, congested, and irritated condition of the super-jacent mucous membrane, to speak of some varieties of asthma and bronchial catarrh, due to certain exciting substances applied to the mucous membrane itself. Specific irritants acting on an unduly sensitive mucous membrane may first of all bring about rapid congestion with profuse catarrh and flux, and then, after a period of varying duration, bronchial spasm and asthma come in as distinctly secondary effects. I will briefly describe, in illustration of these statements, the symptoms and progress of an attack of summer catarrh, or hay asthma, as in this affection we have an admirable example of the points to which I wish to draw attention.

A small boy, who had enjoyed up to the age of eight years very good health, was playing in a hay field in the month of June, when suddenly he was seized with pro-

fuse flow of tears, and swelling of the eyelids, to an extent of well-nigh blinding him, at the same time came on a violent fit of sneezing. He was taken by his companions into the house, and soon recovered. These attacks continued to recur in the summer whenever the patient was exposed to their exciting cause; but what is of especial interest in the case is the fact that it was not till he was twenty years old that true asthma and breath difficulty were added to the already established catarrh. "Asthma at night," says the patient, "becomes my great trouble towards the beginning of June; after a few whiffs of a cigar I can get my breath easier and manage a deep inspiration which seems to burst open the contracted bronchial tubes, but they soon contract again, and re-set themselves at a diminished calibre. That which gives real and continued aid in my distress is smoking strong tobacco in a pipe until I am approaching a condition of collapse. A failing pulse and a damp sweating skin are always accompanied by marked alleviation of the sufferings, the relaxation of the contractile tendency affecting the bronchial as well as the other muscles." (Salter, 328.)

Here we have, then, an excellent example of hyperæmia and flux, due to direct irritation of the mucous membrane, existing for some years, and eventually complicated with a very severe form of spasmodic bronchial asthma.

Other forms of congestive catarrh and spasm of similar type are seen in examples of asthma caused by the aroma of fresh coffee, by inhaling the dust of lamp black, of ipecacuanha powder, and of linseed and mustard meal. Two cases of very severe spasmodic asthma, due to excitation of the naso-pulmonary mucous membrane by these

two last-named agents, have come under my notice. One patient, recently under observation, begged me on no account to prescribe ipecacuanha in any form; "for once," said he, "I had fifteen drops of the wine of ipecacuanha given to me, and it brought on such a paroxysm of asthma, that I was well-nigh choked, my lower chest seemed powerfully retracted, the difficulty of drawing in my breath was extreme, and perspiration rolled off from me." Here the ipecacuanha wine might have acted in a reflex way, through the gastric branches of the vagus nerve.

When we examine into the history of cases of genuine hay asthma and summer catarrh, we find nearly always that the coryza and catarrh precede the asthma. Possibly, as in the case lately narrated, several years may elapse before the summer catarrh becomes complicated with breath difficulty and spasm.

Another point, brought out by inquiry into the history of cases of hay asthma, is the ingravescent nature of the affection. It grows worse with every fresh attack, and the susceptibility to the exciting cause, instead of diminishing with exposure and lapse of time, increases and becomes more deeply rooted in the system. The blood vessels more readily congest, and the congestion goes deeper down into the air tubes. The sudden advent of the catarrh is familiar to all, and one need not go far to find those who can describe all the distress attendant on the attack. A lively and telling account of catarrhus aestivus, hay, rose, or peach, cold or asthma, is given by Dr. Dobell, in his work on "Winter Cough," and is a lively bit of reading, in full detail. "The cross of my life," says the writer, "is DUST, and I print the word in capitals. Once exposed to dust, every particle is to my

eyes as a grain of cayenne pepper, and itching eyes, snuffing, sneezing, and vexed temper, are at once my lot." The writer then goes on to describe the dyspnœa which follows on the catarrhal state, and presents the usual characters of bronchial asthma.

The catarrh begins in the eyes and nasal passages, and we may get speedy asthmatic complication of reflex type, owing to irritation of the Schneiderian membrane. Then the asthma reminds us of the attacks we see occasionally caused by the irritation of a nasal polypus, and which either cease entirely, or are sensibly mitigated, when the offending polyp is removed. If the direct irritation of the Schneiderian membrane does not, however, determine the asthmatic complication early, we observe the catarrhal state, as attacks recur year by year, to pass downwards into the air tubes, and then, and very often not till then, do we behold the asthma in full force. Under these conditions we must admit bronchial congestion as a most important factor of the asthma.

The causation of summer catarrh has been admirably demonstrated of late years by Dr. Blackley, and I wish that time would allow me to detail some of his experiments. Dr. Blackley finds attacks of hay fever to be most prevalent and severe about the 28th of June, and at this period of the summer he found he could collect on glass slides, moistened with glycerine and exposed to the air, the largest number of pollen granules from flowering grasses.

The first person to demonstrate by actual experiment the power possessed by pollen to excite catarrh and sneezing was Dr. W. P. Kirkman. He tells that a day or two before Christmas he noticed in his hot-house for flowers, one single plant of the *Anthoxanthum odoratum*

in blossom loaded well with pollen. He thought it would be a capital opportunity for trying this particular grass; so he plucked it, rubbed the pollen with his hand, and sniffed it up his nose. Almost immediately it brought on sneezing and all the symptoms of hay fever, which continued for an hour and then left him.

Some writers have attributed summer catarrh and asthma to the inhalation of the vapour of benzoic acid given off at a low temperature. Most careful experiments by Blackley gave no support to this theory of the origin of the disease; and a series of most interesting experiments in reference to the presence of ozone in the air gave no support whatever to ozone as an exciter of hay asthma. Dust, so bitterly complained of by those subject to hay asthma, was found by Blackley often to excite the disorder in his own case; but he nearly always observed that in the dust there existed pollen granules from flowering grasses. Thus the dust encountered in a railway carriage that had come from a hay-making district would be apt to excite hay asthma in a susceptible passenger who might enter such a carriage. Pollen granules may be carried about in the feathers of fowls, and in the fur of such creatures as cats, hares, and rabbits. In experimenting with actual pollen Blackley found some kinds more active than others in bringing on the symptoms of catarrh; but the pollen of all the grasses gave more or less unmistakable evidence of its power to excite catarrh when applied to the nose, or inhaled into the bronchi. The pollen of rye, *Secale cereale*, was especially active, and caused violent sneezings, with profuse flow from the nostrils. I do not find whether Blackley has proved or disproved the statements of some hay asthmatics, that it is only European grasses that cause

them to suffer ; in India they are free. The rapid congestion of the mucous membrane of the nares in summer catarrh soon increased so much that no air could be drawn through the passage ; and it was observed that after both passages had been equally closed for a time, if the patient recline on one side, the nasal passage which is uppermost, will after a while become quite open and free, evidently from gravitation downwards of exuded fluid.

In many cases of ordinary asthma we find the patients complaining of tightness, pressure, and obstruction across the bridge of the nose, and we may accept this as a sign of the congestive character of the asthma. True hay asthma is eminently a congestive form of dyspnœa, and if the mucous œdema affect much the tissue of the larynx and trachea, the disorder may assume a very serious aspect. That, however, a neurotic element is present, as well as congestion, seems borne out by the circumstance that the asthmatic breathing has been brought on by looking at a picture of a hay-field ; and that a young lady who, in the proximity of a stable, had to sit up all night in extreme dyspnœa, next day, could dance and sing with ease and comfort.

How far nervous influence may control and affect catarrh and congestion, I will not now seek to inquire, but there are curious and interesting facts that come under our notice from time to time that are worth recording. One man, whose case has been already quoted, and to whom dust was so very baneful, declared that if when perspiring he got a chill, catarrh and asthma were the immediate results. The sympathy of the internal mucous membrane with the external skin in its disordered state is continually brought under our notice. Often we see spasmodic asthma associated with definite skin dis-

ease, and the remedy that cures the one often cures the other too. A child may have a running eczema of the skin, and at the same time obstinate bronchial catarrh, and probably any very sudden check of the external flux would tend to increase the catarrh ; while a well-chosen method of constitutional treatment on the other hand would cause the subsidence *pari passu* of both the external and internal disorder. These matters respecting interchange and distribution of the catarrhal state, are most interesting and suggestive, and I was led to dwell upon them by a few remarks made to me by our President after my first lecture. The plan I had laid out with reference to the special points to be selected and treated prevents my following this inquiry so far as I could wish, but I will give the notes of two cases bearing on the subject.

Mrs. R. G., living in Warwickshire, had been for several summers liable to very profuse catarrh during the hay-making season, but knew nothing of asthma till one day she had a great fit of laughter, and then found she could not get her breath. From that time she became decidedly asthmatic, the attacks commencing with a great itching under the chin, a good deal of coryza and flux, and great tightness across upper part of chest. But little expiratory wheezing was heard after the fit, and great relief was gained by taking moderate doses of hydrate of chloral. In this case I especially noticed a red erythematous rash, which appeared on the chest whenever the asthma and catarrh came on, indicative, I thought, of vaso-motor disturbance and vascular congestion.

In 1871 I had a medical man, æt. 32, under my own for very troublesome asthma, of catarrhal form, and

almost always this gentleman observed an eruption of real urticaria to appear on his skin whenever he had his catarrhal asthma. In this case the catarrh preceded by some years the bronchial spasm. The remedy found most useful by this patient was the induction of free sweating.

In another case, also seen in 1871, a young man, æt. 21, had been subject to spasmodic asthma, with catarrh, for nine years ; and previous to that date he had suffered much from moist eczema on the skin. These instances show the reason there is for admitting vascular disturbance in the way of congestion and hyperæmia as an element in the causation of catarrhal asthma, be it hay asthma or not.

The bronchial spasm appears as a secondary neurosis succeeding often to pre-existent catarrh. To attribute the whole of the dyspnœa to congestion alone is what I am not prepared to do ; for that mucous congestion intense enough to cause complete obstruction of the nostrils, as in hay catarrh, should extend in like degree by continuity of tissue all down to the smallest bronchi, can hardly be accepted, for surely then larynx, trachea, and bronchi would be so occluded as to cause actual asphyxia.

Asthma due to, or associated with, bronchial congestion usually soon gets speedily bad when the patient lies down at night.

A small boy, æt. 9, was under my notice in 1873, who never knew anything of asthma till at the age of 4, when he passed through an attack of scarlet fever. He had no anasarca, as I was informed, but ever after the scarlet fever he remained liable to asthma, which was always worse when he lay down in bed ; was relieved often by sneezing, as well as by coughing up mucus. The urine

was normal, save excess of lithates. The inspiration was attended with a few sonorous sounds. A dry, bracing air did more good than any medicine in this case.

Dr. Blackley, in his observations upon himself when affected with hay catarrh, found that if he lay flat on his back he could easily bring on all the distress of a true asthmatic attack. Blackley considers congestion the sole factor of the asthma. Here, as I need not tell you, I do not agree with him. The congestion causes dyspnœa, but true bronchial asthma requires, for its production, that muscular spasm be added to bronchial congestion.

Illustrations of muscular spasm, induced by contiguity of inflamed membrane, are often brought before us. I may instance spasm of the laryngeal muscles coming on suddenly as a most dangerous complication in laryngitis. Already I have referred to bronchial spasm and asthma as a secondary neurosis resulting from bronchitis ; and I may instance the case of a member of our profession, who while travelling about to get rid of a persistent bronchitis, suddenly, while passing a night at Gibraltar, was taken with spasmodic asthma ; and so severely did this asthma keep its hold, that when consulting me in August last, this gentleman informed me that for 340 nights out of 365 he had had to sit up for two hours or more fighting for breath, " and you may judge what that is," said he, " to a man actively engaged in practice during the whole day." The means by which this physician was eventually much relieved will come before us again presently.

In another case, the course of events tended to a different issue, and a brief narration of the case will bring me to the question of emphysema in connection with asthma.

The patient was a clergyman of ample means, who, in

consequence of very troublesome bronchitis, was sent many years ago to Madeira, when he returned with dysentery as an unwelcome addition to his bronchial inflammation. He told me he knew nothing of asthma till he went to Torquay, and there he was seized quite suddenly at night, and he learned that five people of his acquaintance at Torquay had all experienced severe asthmatic attacks during that same night. The case of this clergyman, referred to, I find, by Salter in his table of cases, was instructive, and illustrative of the course of many cases of asthma connected with bronchitis. First, the poor man had troublesome bronchial inflammation, which appeared to irritate the nerves from the pulmonary plexus, which Remak has shown to be distributed to the bronchial muscles. Then under some peculiar atmospheric exciting cause this muscle was thrown into spasm, and the patient surprised by a fit of asthma ; and from that time bronchitic and asthma clung to him for the rest of his life. Gradually the spasmodic seizures became less severe, while very marked atrophous emphysema of lungs came on, expiration being notably difficult and prolonged. It seemed, therefore, as if spasm and inflammation together had worn out the strength of the bronchial muscle, and during the latter years of this patient's life, his distress was from over-distended lungs, impeded expiration with paralytic and wasted condition of bronchial muscle.

Few will dispute the proposition that the establishment of an atrophus emphysema of lung materially compromises the permanent recovery of an asthmatic patient. In my last lecture I laid stress on prolonged and laborious expiration as a sign that emphysematous distention of the air vesicles either was, or soon would be, developed ; while, on the other hand, I also stated that where the attack of

bronchial spasm was sudden, though severe, inspiratory distress marked, the patient young and free from any antecedent inflammation of his bronchi, that then we might look for a complete recovery, a statement confirmed by one or more authorities to whom I make reference.

Now, with respect to emphysema as a concomitant of asthma there is something to be said, for I am sure I have on occasions over-estimated the degree of emphysema present in the lungs, and given an unwarrantably bad prognosis of the case in consequence. Some of the latest observations published by Dr. Salter in the *Lancet* make me think he, too, was conscious of having fallen into the same error. The causes of the mistake I believe to be a want of due recognition of the causes and forms of emphysema in the first place ; and, in the second place, want of attention to the way in which the diaphragm is acting. Of the forms of emphysema, one may be a mere mechanical distention of lung, due to impeded expiration ; and it is in the lung apices we notice the emphysematous signs first, as these parts suffer first from expiratory pressure. This was shown in the case of M. Groux, the man who had a congenital fissure in his chest wall, through which the movement of the lung could be observed. During forced expiration the lung came forward into this sternal fissure as a long tympanitic tumour.

Von Ziemssen, too, had the opportunity of seeing the case of a robust man, æt. 45, in whom there existed a congenital deficiency of the pectoralis minor, and of the entire sternocostal portion of the pectoralis major, so that the muscles of the four upper intercostal spaces were covered only by skin. On quiet inspiration a considerable sinking in was noticed in these situations, which was succeeded in expiration by a filling out of the same spaces ; and on

forced expiration these intercostal spaces were powerfully puffed out and disturbed.

When the intercostal muscle was made to contract over the space by galvanism applied, then the bulging was not observed in that one space during expiration.

The obstructed expiration due to an attack of bronchitis we know to cause a temporary over-distension of lung—an acute emphysema subsiding with the subsidence of its cause, just as the temporary emphysema of whooping-cough subsides as the neurosis itself passes away.

Salter says he is convinced that he has seen emphysema of lung come on without any antecedent bronchitis, and in this I agree, though I do not hold that emphysema unconnected with bronchitis is always a mechanical affair, and independent of nervous influence. I believe that imperfect innervation through the vagus nerve may lead to defective expiration and emphysema ; indeed, experiment has shown that section of the vagus will cause slow breathing, prolonged expiration, and emphysema of the lungs. Emphysema of centric nervous origin may develop with great rapidity, as in a case recorded by Dr. Walshe, where well-marked vesicular emphysema was found in the lungs of an infant that only survived its birth by two hours. No form of bronchitis, pneumonia, or atelectasis of lung was present, "but," says Walshe, "almost immediately after birth this infant was seized with extreme difficulty of breathing, probably of cerebral origin," and so died.

In a case recorded by my former colleague at Victoria Park Hospital, Dr. Baumler (Path. Trans. xxiii.), where an aneurism pressed on and paralysed the right pneumogastric, the lungs after death were found large and emphysematous. A former distinguished President

and Lettsomian Lecturer of our Society, Dr. Habershon, has paid attention to the effect of pressure on the pneumogastric nerve, and he has observed that first this pressure leads to paroxysmal and spasmodic contraction of the muscles of the larynx ; secondly, to diminished muscular power, with paralysis and wasting of the laryngeal muscles ; and, thirdly, to pulmonary congestion.

Dr. George Johnson has reported a case of death from an aneurismal tumour pressing on the left pneumogastric and recurrent nerves, and here the lungs were found " very œdematous," and the muscular structures of the larynx notably atrophied.

From these statements we may, I think, infer that emphysema may be developed in the lungs under defective innervation, as well as under the influence of mechanical distention of the air vesicles.

Provided the nerve failure be not due to any organic cause, these cases of emphysema, prolonged expiration, and dyspnœa may, and do, improve wonderfully often, under the influence of a tonic and bracing air, if the condition of general atony be marked ; or under a pure soothing air, where intercurrent spasm comes on, and there is reason to suspect a lurking bronchitis. The way in which patients, who have been for months in a constant state of chest distension and oppression, very rapidly improve, so as to be able to run up hills in Cornwall, Ventnor, and other places, makes me believe strongly in defective innervation as a great cause of their emphysema and breath troubles. Time forbids me to quote a few cases that have impressed me much, but when I come to the medicinal treatment of these cases, I shall hope to have time to mention the excellent effects exercised by nux vomica as a medicine for them.

The really bad cases are those of atrophous emphysema. Here we find, as in the clergyman's case already reported, a history of bronchitis to weaken the bronchial muscle; next, bronchial spasm to strain and stretch the air cells; then gradually spasm gives way to paralysis, the lungs waste, air stagnates in them, the blood is badly oxygenated, the heart suffers, and, like the air cells, becomes either fibroid or fatty, and death by syncope often closes the scene. The clergyman, who was so typical an example of this sad course of events, I was told, died at last of syncope.

These are the cases where expiratory dyspnœa is characteristic and marked. Often I have heard the patients say that they want to get the air *out* of their chest; and one intelligent man remarked spontaneously, that it seemed as if a door existed, by which air was let in, but then it would not re-open to let the air out. In this man's case, chest distension was well seen, the lower chest not retracted, and the diaphragm obviously depressed.

We are reminded here of those singular cases of asthma described by Wunderlich, where a gradually increasing dyspnœa culminates at its maximum in two or three days, with chest motionless, and hyperesonant with pent-up air, heart and liver both pressed down, the former by distended lung, the latter by distended lung and depressed diaphragm. This condition of chest is a truly distressing one to witness, and differs pretty evidently from the severe bronchial asthma, with retracted epigastrium, seen in young persons. If not relieved the patient becomes livid, and complains of twitching and jumpings in his limbs, due to the circulation of carboniferous blood through the system. The diaphragm here is deeply concerned, being depressed, and apparently in a semi-paralytic

condition, and when things are thus the case is, in my experience, a most unpromising one. "That paralysis of the diaphragm is incompatible with the duration of life," as once stated, is not absolutely true, for Duchenne has clearly proved that life may hold on without serious disturbance, so long as the accessory muscles of respiration and the lungs remained unaffected, though the diaphragm be as a matter of demonstration, completely paralysed. In a work on asthma (*a*) which I published some years ago, I have made reference to this diaphragmatic palsy and inertia as greatly adding to the intractability of emphysematous asthma ; and as experience has grown, I am but confirmed in my belief. I see cases of persons with no great amount of bronchial spasm, who are always short-breathed, have weakness of voice, often tendency to vomiting, both on full and empty stomach, and whose chest and abdomen are distended, prominent, and motionless. When no actual spasm is on, the chest is almost noiseless, little air movement can be heard, and expiration is feeble and long. These are about the most intractable cases one can meet with in practice. If there be a remedy, it must be sought in climate rather than in physic.

Galvanisation in the course of the phrenic nerve has been suggested, but I have no experience to bring before you as to its success.

This peculiar condition of diaphragm has been observed in saturnine asthma, as a result of lead in the system. The importance of recognising this depressed state of the diaphragm in cases of emphysema, with or without asthmatic complication, I observe to be alluded to in the very recent work of Dr. Headlam Greenhow, on Chronic Bron-

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(*a*) "Notes on Asthma." Third Edition. J. and A. Churchill.

chitis ; and I there learn that thirty years ago Dr. Stokes of Dublin, drew a distinction between those cases of emphysema, or, as he terms it, dilatation of the air cells, in which the diaphragm is displaced downwards, and those in which it is not so displaced.

Stokes gives the case of a young man, who had distended chest and emphysematous lungs, but yet presented no evidence of depression of the diaphragm. This young man did not suffer from difficulty of breathing in the intervals when he was free from bronchitis, and was able to take very active exercise ; having, shortly before entering the Meath Hospital, walked a distance of 40 miles in one day. His chief inconvenience was the frequent occurrence of bronchitic attacks.

In the case given by Dr. Greenhow himself of a man who made well marked improvement from a condition of emphysema, complicated with asthma as a secondary neurosis (253, 254), it was observed that the abdominal muscles were in unusual activity, and so much hypertrophied that the situation of the linea alba and lineæ transversales was marked by distinct furrows, indicating the powerful nature of the expiratory effort to press up the diaphragm, and empty the lungs of stagnant air.

I trust I have thus exemplified the important part taken by the diaphragm in connnection with emphysematous dyspnœa. Till I learned fully to appreciate this, I often wondered why some cases of dyspnœa, not characterised by any well-marked attacks of bronchial spasm, were so much more incurable than other cases, where bronchial spasm was a prominent cause of complaint on the part of the patient ; and I soon found that in these intractable cases there was not only evidence of lung distention and emphysema, but also very imperfect action of the dia-

phragm, and marked over-fulness of the lower chest. Nux vomica and strychnia, remedies so very useful in pure emphysema, were quite powerless in this condition of diaphragmatic inertia. It is worth while always to seek for a small zone of congested capillary vessels, which at times may be found on the surface corresponding to the line of the diaphragm.

Being desirous in this lecture on the Pathological Relations of Bronchial Asthma to say a few words on the true degenerative changes of lung tissue that may result from prolonged asthma, I am obliged to omit the consideration of the pathological relations of heart disease, renal disease, and gout, and proceed to degeneration of pulmonary tissue.

The question before us is, Will prolonged attacks of bronchial spasm lead to phthisical or tubercular disease in the lungs, as well as to emphysematous distension and degeneration of the pulmonary muscles ?

Bronchial spasm is a disorder of function; phthisis and emphysema are diseases of tissue, and as a general rule prolonged disorder of function, sooner or later, leads to structural tissue change. While, as I have already shown, bronchial congestion may become a determining cause of bronchial spasm ; so we have the reverse condition often brought to our notice, where severe attacks of bronchial spasm, relieved by inhaling burning nitre paper, exist for years before any signs of cough or bronchial congestion become apparent ; a well-marked example of this course of events I have now under observation.

A man had typical seizure of bronchial spasm for years, and then began to have a cough, and slowly developing symptoms of emphysema and bronchitis as a secondary

effect. In seeking into these secondary effects of bronchial spasm, by far the most common is vesicular emphysema of the lungs ; and some cases that have come under my notice, where persons who have been long asthmatic have eventually become phthisical, seem to me to have been examples of the extension of atrophous emphysema into a destructive process involving the lung substance. For the victim of spasmodic asthma to become really tuberculous, and die with genuine grey tubercles present in the lungs, appears a most rare event. One case I have found reported from the German, where a young student, who was liable to most intense attacks of spasm with great drawing in of epigastrium, eventually died ; and a post-mortem examination showed the lungs full of grey tubercles. My own experience fails to afford any similar case ; and of those that I have noted of patients who have died of genuine acute tuberculosis, I do not find any note of asthmatic attacks as features in their history. In a well-marked case of miliary acute tuberculosis, given by Dr. Peacock, where a young lady, 22 years of age, fell ill on May 14th, and died on June 1st, there was dyspnœa, aggravated in the recumbent posture, as a prominent symptom, together with great acceleration of the respirations ; but I do not find any antecedent history of asthmatic seizures, and auscultation revealed nothing more than harshness in the respiratory murmur. There seemed no auscultatory evidence of bronchial stricture. Post-mortem—both lungs were more or less airless, and filled with small miliary tubercles, none of which had undergone any softening process.

I do not find any evidence to associate miliary tubercles with attacks of bronchial spasm, though we can conceive the possibility of the conjunction of the two

affections in certain cases, from what we know of the causation of bronchial spasm by bronchitis and bronchial congestion.

That protracted asthma should lead to a phthisical destruction of lung, is not a common event, and yet I can find illustrations of this occurrence from my own experience, as well as from that of others.

In Salter's table of 223 cases of asthma, there appear 49 in whom there is a distinct account of emphysema of lungs, and of asthma existing in some of the members of the patient's family. In 14 cases we find history of phthisis as a hereditary disease affecting parents, brothers, sisters, uncles, or aunts, and in about half of these 14 cases the physical signs as recorded were such as would suggest the possibility of phthisis, but I only find one mention of hæmoptysis among them.

Looking over my own notes of cases where asthma has issued in phthisis, I find the termination certainly an uncommon one, and I find hæmoptysis nearly always recorded among the symptoms.

The cases prone to go into phthisis are those of persons approaching to, or fairly in, middle life, who have been for some time asthmatic, who come of an ancestry liable to pulmonary disease, and in whom the physical signs of atrophous emphysema of lungs are well marked.

The presence of small fibrinous casts of the minute bronchi in the expectoration always makes me expect a phthisical termination of the case, and there used to be in our museum at Victoria Park Hospital a most characteristic fibrinous branching cast of some of the twigs of the bronchial tree that had been coughed up by a gentleman, who, having been for many years liable to asthma, eventually died of pulmonary phthisis.

In atrophous emphysema there is feeble nutrition

of the coats of the bronchi, and the fibrinous casts formed tend to irritate and destroy the weak bronchial membrane, and so to set up ulcerative destruction of the lung. A natural inherited weakness of the bronchial membrane and air vesicles may constitute the hereditary element in the case, and such a weakness may be derived from parents affected with any form of pulmonary disease. Of three cases where I was able to get full and complete notes of asthma turning to phthisis, in one the fibrinous sputum was noted, and this was in the case of a man who died late in life, and when young had suffered much from gout.

Of my two other cases, one was that of a gentleman, æt. 60, who for years was liable to very severe spasmodic asthma, gradually spasm passed off, dyspnœa became constant and abiding, blood appeared at intervals in the expectoration, moist crepitation became distinct at right lung apex. Temporary benefit followed on the use of cod-liver oil and hypophosphite of soda, but in about three years death, with all the signs of phthisis, took place.

My second case was that of a lady, æt. 21, whose father was living, and a great sufferer from bronchial asthma. The daughter, during her childhood and early youth, had also suffered severely with fits of asthma, usually relieved by inhaling the smoke of burning nitre paper. When I saw her in September, 1876, these spasmodic attacks had passed away, but she had a pulse of 120, copious purulent expectoration, at times streaked with blood, and abundant sub-crepitant râles over upper third of left lung, and hoarseness of voice. She improved more than I expected on pills of creasote and syrup of hypophosphite of lime; but rather more than twelve months after I first saw her, I heard of her death from phthisis at her home in the country.

LECTURE III.

TREATMENT OF ASTHMA.

HAVING in my two preceding lectures endeavoured from the observation and history of cases to point out what distinctions we may recognise among the various forms of bronchial asthma, I now seek to show how far the correct appreciation of these distinctions can be made available to guide us in the choice and application of our remedial measures.

Floyer, writing in 1717, says: "Since the cure of the asthma is observed by all physicians who have attempted the eradicating that chronical distemper, to be very difficult and frequently unsuccessful, I may thence infer that either the nature of that disease is not thoroughly understood by them, or they have not yet found out the medicines by which the cure may be effected." Now if physicians have not yet found out the medicine to cure asthma, it certainly is not for want of experimenting with various drugs and preparations, for there seems hardly a known medicine that has not been tried, and I could enumerate a long list for which distinguished success has been claimed by their respective advocates.

Further to pursue the plan of specific-hunting is hardly likely to advance us much towards what is positive and practical, and the more promising course appears to be to seek to turn to account the knowledge we have gaine

by experiment and observation of the nature and causation of bronchial spasm and congestion. Thus we may discover how to select and apply some of those numerous remedial means with which we are so amply provided.

Experiment has demonstrated how much respiratory action is under the influence of the pneumogastric nerve, and reflection on the wandering course and numerous connections of this nerve will show why it is that our treatment of asthmatic spasms must be very varied, and is not always so precise in its result as we could desire.

To cure asthma we often have to treat other organs than those of respiration, and the way to success may lie in the correct adjustment of a displaced womb, in the administration of a dose of extract of male fern to dislodge a tapeworm, or in a course of Carlsbad waters for one who perhaps for long has been smoking all manner of cigarettes with little further effect than the production of vertigo and giddiness. Did time permit I could illustrate each of these conditions by a well-marked example.

The capriciousness of asthma, with regard to the influence of various agencies is notorious, and a book might be filled with an interesting collection of cases.

What better illustration can I find than a glance at the effect of atmosphere and climate on persons liable to asthmatic seizures. Theory would say, It is very clear that seeing how bronchial spasm and air stoppage must have the effect of carbonizing the blood, a pure air is the first requisite for an asthmatic patient. Practice shows this to be often right in cases of congestive asthma and weakness of vessels generally, but to the victim of true spasmodic asthma a pure clear air is often utterly unbearable, and we find them hurrying away from the clear bracing air of places like Margate, Whitby, and Nice,

literally in terror of losing their lives if they pass another night in one of those climates.

The late eminent oculist, Mr. Dalrymple, of Grosvenor Street, when summoned into the country, was not uncommonly compelled to hurry back to London without even seeing his patient, in consequence of the terrible spasm in his breathing that came on in the pure air of the country.

Salter has gone carefully into the history of twenty cases of asthma powerfully influenced by atmosphere; the evidence adduced is of a most opposing character, and of little practical avail. Fourteen out of these twenty cases could respire with comfort only in the smoky air of populous cities; eleven seemed actually cured by London air. Seven others were quite unable to live in cities, and did best in the country. From the perusal of Salter's reports, as well as my own, I cannot find, either in peculiarity of patient, or of atmosphere, the cause of this capriciousness in the way the asthma selects its victims. If it be the dryness of London air that is so wholesome for asthmatic lungs, how comes it that Lord B., as told us by Dr. Ogier Ward, has been obliged to leave London at two o'clock in the morning and drive to Epsom, the intensity of his asthma threatening his life. At Epsom he is said to find immediate ease, and yet the air there is reputed a dry air.

The wonderful relief to breath difficulty experienced by many asthmatics in the close air of a town is continually brought to our notice. One patient of my own, with a most comfortable home in the northern outskirts of London, finds himself glad to quit it and pass a winter in residence at his business premises in Cornhill. Another, who declares that he has vainly tried all the resources of

medical art, passed six weeks in Queen Anne Street, Cavendish Square, without feeling a trace of his asthma. On returning home, some few miles south-west of London, he got such a bad seizure, that though well versed by sad experience in his sensations, he was nevertheless obliged to send urgently in the night for his regular doctor. One great sufferer in the country breathed well in London, but wrote me word that on returning home the asthma received him with a most warm welcome. Those who have read Walshe's work on the lungs will remember the case of the man sorely tormented with asthma at Hampstead, for whose relief every known remedy had been vainly tried, and who was cured in an almost miraculous way by changing his residence to the central region of the Seven Dials. To explain why town air suits some asthmatics so well is not easy. Finding that ozone inhaled causes pulmonary irritation, I thought that it might be the absence of ozone that rendered the air of towns sedative to excited nerves in the respiratory passages.

In connection with this question I may refer to the observation of Schönbein, the discover of ozone, who found that when air highly charged with ozone was inhaled it brought on a painful affection of the chest—a sort of asthma with a violent cough, which obliged him to discontinue for a time his investigations. Struck with this, Schönbein got several physicians at Basle to compare their lists of catarrhal patients with his tables of atmospheric ozonometric observations, and he and they were struck by the unusual prevalence of catarrh on the days when the iodine test papers showed that ozone was unusually abundant in the air. The observations of Dr. Carl Haller, of Vienna, prove that catarrhs and pulmonary inflammations rise and fall in frequency, very

much in the ratio of the presence or absence of ozone in the air.

Schubler and others experimenting on animals (see Dobell's 3rd volume of "Reports on Chest Diseases"), found that ozone inhaled had an irritating effect on the respiratory organs somewhat resembling the action of chlorine gas. After breathing ozonised air for five or fifteen minutes, catarrhal irritation of the eyes and air tubes came on, the respirations became slow and difficult, and in two or three hours death took place. Post-mortem examination disclosed œdema, and in some cases, inflammation, of the lungs. The discomfort sometimes experienced by asthmatical subjects on a sunny bright day in the neighbourhood of luxuriant vegetation, may be due to the ozone given off by growing plants when exposed to the action of sunshine. That however ozone in the air is by no means necessarily provocative of asthma, is shown by the following facts :—

Dr. Blackley found that he could expose himself to sea air highly charged with ozone, as evidenced by the iodine test papers, and remain perfectly free from anything like asthma and catarrh. A young and bad asthmatic among my own patients was always in great respiratory distress on the sea coast, and naturally enough dreaded a voyage to Australia. He embarked at Gravesend, and while the ship was going down the lower reaches of the Thames he was obliged to resort to his pipe, but once fairly at sea he had no breath difficulty whatever, and wrote to me from Sydney to say the sea voyage had cured his asthma in a way that greatly puzzled him, his own sensations leading him to the impression that the phosphorescence of the sea waves had much to do with the promotion of free respiration. At any rate, the experience of this

young man showed that sea-side air may be an effective cause of bronchial asthma in one who fairly out on the ocean in a ship loses every trace of his troublesome disorder. Careful ozonometric observations made during the voyage from Lizard Point to Cape Otway (Victoria), showed that ozone was always present in the air, the amount ranging as from 10° to 3°. If ozone be always in all cases an exciting cause of asthma, one could hardly expect a person eminently subject to the disease to make the voyage to Australia without the least respiratory distress.

I have searched for evidence of asthmatical people becoming attacked after a thunderstorm, when the air is full of ozone. Some there are who are uncomfortable in this sort of air, and among Salter's cases one is mentioned who had asthma complicated with bronchitis, and who was, after a cessation of spasm for some years, attacked unexpectedly and severely after a thunderstorm. When this attack had passed away there was no return for a period of five years.

The facts thus narrated seem to me worth bearing in mind, in hope that increased experience and observation may lead to something more positive in the way of a result than we have a right at present to claim, for as yet we are obliged to say that the climatic treatment of asthma is an experimental affair, and the best practical rules we can lay down appear to be that, if spasm be very pronounced, then probably a town air will suit best. If the attacks are associated with atony of system and loss of vascular tone a dry bracing air seems to me to do most good ; and, at all events, if a patient be very bad on a certain soil, or in a certain kind of air, get him away to a locality and air of as different a nature as can be found.

A mild, sedative climate, like that of Ventnor or Torquay, will do wonders, I find, for some patients, who suffer greatly with chronic bronchitis, pulmonary emphysema, and bronchial spasm, when in town, The mild air soothes the irritable muscle, and, causing its free and rhythmical action, allows a more complete aeration of of the blood ; hence increase of strength and appetite appear as highly favourable symptoms.

In selecting for consideration some of the numerous means employed for the relief and cure of asthma, I speak first of the use of certain fuming inhalations that experience has proved valuable in alleviating bronchial spasm. The well-known nitre paper is best made by dissolving 4 oz. of nitrate of potash in a pint of hot water, and in this should be soaked a porous paper of the thickness and consistence of ordinary blotting paper. The paper thus made will be a strong, fiercely burning paper, and should be kept in a stoppered bottle. When used it must be burnt fast and furiously, so as to fill the room, and commonly it is not till the atmosphere is quite thick with nitrous vapours that the asthmatic gets relief. On this point experience leads me to speak strongly. Salter used to say that the more purely spasmodic the asthmatic attack, the more speedy and certain became the relief obtained from the burning nitre paper, and that if any bronchitis was present, then the nitrous fumes might even add to irritation and distress. There is some truth, I am sure, in this statement ; nevertheless, a physician, well able to judge, declares that in his asthma and bronchitic cough the fumes of the nitre paper are more effectual than any other remedy in affording relief. The sort of case to be treated by nitrous fumes is such a one as this. Miss W., aged 20, had asthma since her fourth

year. The attacks came and went with great suddenness —evidence, I take it, of their spasmodic nature—and her father, who was himself a medical man, obtained all sorts of advice for her, to no purpose, though when sent to the sea-side she lost her asthma for four months. One morning the state of things stood thus: the young lady was sitting with body thrown forward, shoulders raised, and the noise of the air rushing through the constricted tubes so loud as to be heard in the lower part of the house. A sheet of nitre paper was burnt till the room was filled with a cloud more dense than even a London fog. Scarcely had two minutes passed when, changing her position, she lay back on her pillows, and in ten minutes her delighted father found her breathing as quietly and noiselessly as an infant.

Early one Sunday morning in March, 1870, Dr. Salter, being himself indisposed, asked me to go down into Kent to see a bad case of asthma, to which he had been urgently called. When I got to the patient's house I found him sitting in his drawing-room, feeling pretty comfortable, but his doctor told me that it was not till he had regularly filled the room with a suffocating vapour of burning nitre paper that any relief to the breath was obtained.

This gentleman was sixty years old, and had been asthmatical from the age of twenty. About that time he told me that he consulted a then eminent physician, in Finsbury Square, who, as soon as he saw him, and had heard a word or two of his story, said—

"Little use your coming to me, young man, for I have had asthma all my life, and have it still; if there is anything to do you good, it is strong coffee." This patient lost his asthma while at Ventnor. When he got to his

own home, near a river, back it came again, and the fits grew upon him till be became almost black in the face. Dense nitrous fumes surpassed anything else in giving ease to his breathing. I ordered tincture of nux vomica, as a regular medicine, and chloral hydrate to be given when the spasm came on ; but the doctor wrote some time after to tell me that calomel pills and decoction of aloes, and nitrous fumes, surpassed any of my remedies in their curative action.

Though experience has taught me the necessity of pretty well smothering a bad asthmatic with the nitrous fumes, still I have come across cases where a small inhalation of a mild nitre paper appears to prevent asthma attaining a climax of severity. The sleeping patient turns and becomes uneasy in his respiration, and then nitre paper burnt near to him may have the happy effect of easing his breath and maintaining a condition of calm repose ; if no one is at hand to light the paper, the fit culminates in a wakeful spasm of severe kind, requiring chloroform vapour for its relief.

I cannot ascertain who it was that discovered the value of burning nitre paper to cure the asthma. In the *London Medical Gazette*, of September 4, 1846, there is an article extolling the remedy very highly ; and we learn, in the *Lancet* of April 5, 1845, how a friend of Mr. Harrison's tried burning blotting paper that had been soaked in a saturated solution of nitrate of potash, and said he felt the inhaled smoke to clear the passages and open the air tubes ; and though he had used this remedy twenty times he had never been disappointed in finding relief in fifteen or twenty minutes.

In America there is a story that an asthmatic man in great distress took out his pipe to smoke, and found he

had no tobacco. Feeling that smoke something he must, he lighted his match paper, and stuffed that in the bowl of his pipe. The paper fumed away, and he, as he inhaled the smoke, found it a quicker and better cure than the tobacco had hitherto been.

In Salter's table of 223 cases of asthma, there were 65 to whom nitre paper proved a most valuable remedial agent. Several of these are noted as having emphysema and slight bronchitis to complicate their asthmatical spasm, showing that a slight degree of these two conditions does not invalidate the remedial action of the paper.

The chemical products resulting from the combustion of nitre paper have been examined by M. Vohl (see *Journal de Pharmacie et de Chimie*, 1866, p. 155,), and he found the nitrous fumes to contain watery vapour, traces of cyanogen, carbonic acid and nitrogen gases, ammonia, and nitrate of potash. To the ammonia and nitrate of potash, M. Vohl attributes the anti-spasmodic action of the nitrous fume. The constituents of the fume seem so closely allied to the adventitious impurities found in the air of smoky towns, that I went over Salter's table of his 223 asthmatics, to see if I could make out that those persons who are put down in the table as being notably relieved by the nitrous fume, were also those who were either much relieved, or quite cured by London air. I found that of the 22 who are reported to have obtained marked relief to their breath from the air of London, there were nine to whom the nitre paper was very valuable. Two, who are said to have been quite cured by London air, found the paper more serviceable than anything else they had tried. One, who suffered much in London, found nitre paper rather harm-

ful than otherwise. It is to the ammonia and carbonic acid gas that I think we may attribute some of the anti-spasmodic action of the burning paper, for it has been shown by Trousseau and others that often ammonia vapour will speedily cut short an attack of bronchial spasm; and Salter reports one case where the spasm was at once nipped in the bud by cautiously inhaling the vapour of diluted ammonia. An asthmatic sea captain was free from his breath trouble when conveying a cargo of guano, a product which slowly evolves ammonia. To carbonic acid gas some degree of anti-spasmodic power has been attributed; for it has been stated that the reason why an asthmatic, when black in the face, and apparently at the very verge of asphyxia, suddenly begins to mend, is that the carbonic acid in the blood acts as an anti-spasmodic and sedative to the nerves of the bronchial muscle, and so relaxes the spasm—a theoretical notion which as yet does not seem to me convincingly demonstrated.

That the nitre paper fume is an anti-spasmodic I judge from the very speedy way in which it eases sudden seizures of breath difficulty. A man whom I saw a few days ago with extensive heart disease and dropsy, but now no bronchial spasm, had his symptoms commence with sudden asthmatical seizures, the spasm coming on in such force that he had to leap out of bed in fear of suffocation. Burning nitre paper gave relief speedily; but he was glad to give up his practice of now and then smoking his pipe, for tobacco brought on faintness and great depression. Among Salter's tabulated cases I observe how frequently those who were relieved by the nitre paper, found good also from the use of a pill containing half-a-grain of extract of stramonium.

Stramonium we know to be an anti-spasmodic medicine, and Dr. C. J. B. Williams proved that it had, in common with belladonna, a power of diminishing the contractile excitability of the bronchial muscle.

Nitrate of potash forms, I expect, the basis of the numerous list of proprietary papers sold for the relief of asthmatic persons. Some patients fancy one kind of paper, some another, and very many think nothing can surpass their own home-made nitre paper. I have made and tried papers containing iodide of potassium, as well as nitrate of potash and chlorate of potash, but do not find them to be in any way superior to the nitre paper. Nitrate of ammonia added to the nitrate of potash appears to have no further effect than to diminish the activity of the combustion, while chlorate of potash increases it.

The use of such antispasmodic inhalations as tobacco smoke and the smoke of burning stramonium, tatula and belladonna, in the form of powder, cigarette, or pipeful, is so familiar to such an assembly as the present that I need not dwell on the subject.

Dr. Robert Bree tried the stramonium smoke in eighty-two asthmatic cases : in fifty-eight it had no permanent effect, and in the remaining twenty-four it acted injuriously. General Gent, who first introduced this practice of smoking stramonium for the cure of asthma, himself died from the over-use of his specific. The Datura Tatula seems a safer and better herb for smoking than the datura stramonium, and in asthma complicated with slight bronchitis I have known the datura tatula smoke prove very soothing. In common with many of my friends, I have had my attention drawn to a variety of powders which, when ignited, burn and give off an antispasmodic smoke, and it is right to say that the powders of which I have had experience,

known as Senier's, Himrod's, Clery's, are really valuable remedial agents. A patient of mine at Victoria Park Hospital carries some of Senier's green powder in a tin box, and if taken in the street suddenly with spasm in her breathing, retires to a corner, puts some powder on the lid of the box, and lights it with a match ; in a minute or two her breathing is relieved. Another hospital patient carries always some nitre paper of his own make, and uses it in a similar way, and with an equally satisfactory result. I have myself soaked nitre paper in tinctures of stramonium and verbascum, having seen the verbascum thapsus recommended in the treatment of asthma, but the objection I find to the use of papers thus medicated is that their fume, when burning, while it relieves the asthmatic breathing, is apt often to produce an unpleasant headache afterwards. I prefer to let the patient try simple nitre paper first, and if that fails he may sprinkle on it some of one of the powders just named, or dry powder of stramonium leaves and seeds, or of dry belladonna leaves, and see if such addition proves of service to him.

Speaking of antispasmodic inhalations, I should like to say a word or two on the use of arsenious acid. That the vapour of arsenious acid has a special action on the respiratory organs seems a well established fact ; and I am informed, on good authority, that men who work in the Cornish arsenic works are seldom affected with phthisis. Indeed, in one instance brought to my knowledge, all the symptoms of phthisis seemed to be removed by exposure to the vapour of the arsenic subliming flues. Whether this happy result was due to the antiseptic action of arsenic vapour, or to some special action of the same on the nerves of nutrition I cannot undertake to say. The fact reminds us that the smoking of arsenical cigarettes has been highly

commended by good authority in the treatment of chronic phthisis.

There are various formulæ given for preparing the arsenical cigarettes, known as cigarettes of Dioscorides, of Boudin, and of Le Vasseur. Trousseau recommended that each cigarette should contain one grain of arsenite of potash—rather too strong a dose, I think, for a few full inhalations of a cigarette containing half, or less than half this amount of arsenite will usually answer the desired purpose well.

It is well known how, in Styria, the peasants eat small quantities of white arsenic to improve the breathing powers, and with the British public the use of arsenical inhalation to relieve asthma is not unknown. Dr. Wilks told me of a former out-patient of his at Guy's Hospital who, in his occupation as a stuffer of birds and animals, used much white arsenic. This man was a smoker, and very liable to asthma, and he said he always found a ready cure for his breath spasm by adding a little arsenic to the contents of his tobacco pipe.

Of the inhalation of nitrite of amyl in asthma I have not much to say. I have used it, and prefer to employ chloroform, as being more certain, more agreeable, and perhaps more safe. The nitrite varies much in strength, and acts with corresponding uncertainty on the patient. The best way to keep it is in hermetically sealed capsules. So far as my present experience of iodic ether or iodide of ethyl goes, it is encouraging, and as this is a new remedy I will give what report I can of its effects. Pure iodide of ethyl (C_2H_5)I is prepared by mixing amorphous phosphorus with absolute alcohol and then adding iodine. After a few hours the process is complete, and the iodide of ethyl can be separated by distillation ; alcohol and iodide

of phosphorus, producing iodide of ethyl, phosphoric acid, and water. The iodide so prepared should be almost colourless, and must be kept in a dark place or it will become decomposed and of a brown colour from the separation of free iodine. My late clinical assistant at Victoria Park Hospital, Mr. Macdonald, has been good enough to provide me with the notes of three cases, under Dr. Andrew and myself, in which the iodide of ethyl was tried. I will read a summary of these notes.

Case I.—C. D., æt. 42, admitted November 19th, 1878, asthmatical five years, has an attack every morning at five A.M., which lasts for about three hours, then passes off, and leaves him free from dyspnœa till the following morning.

Nov. 23.—Ordered to inhale 10 drops of iodide of ethyl four times in the day. The effect was diminished expectoration, and what is coughed up is white, having formerly been of a greenish hue. He said on December 12th that his attacks were neither so severe nor so frequent as they had been before he used the iodide. The urine and sputa when tested gave decided evidence of iodine.

Case II.—Elizabeth S., æt. 17, had been under my observation at intervals for two years, and has suffered severely with attacks of spasmodic asthma and frequent cough and expectoration. Twelve months ago she improved greatly and gained weight under the use of small doses of arsenical solution.

December 10th, 1878.—Has come from Lincolnshire into Victoria Park Hospital, and every morning till December 14th she had at five A.M. a bad attack of spasmodic asthma, with tightness and wheezing of the chest. Strong coffee relieves her, and during the day she is to all appearance perfectly well.

Dec. 14th.—Began to use 10 drops of iodide of ethyl four times a day. She used it thus for one week, and then left it off, having had no asthma; and when she quitted the hospital she had been three weeks without needing the iodide; she had not a trace of dyspnœa, even after meals, no cough, and no expectoration.

In the third case, that of a man with bronchitic asthma of seventeen years' standing, the iodide, deeply inhaled, caused a temporary sensation of vertigo and dizziness; the breath, however, was relieved, and expectoration promoted.

A patient, who for 20 years had suffered much from asthma and bronchitis, told me he attributed a great improvement in his case to the use of iodide of ethyl for three weeks. "I think (writes he) it tended to discuss or lessen the swollen condition of the bronchial tubes; my doctor wishes me to continue it, but being a new remedy I am rather afraid, though it gives me more permanent relief than anything else I have tried." The iodide of ethyl seems to be an anti-spasmodic, and further, an anti-congestive remedy, allied in action to iodide of potassium, a salt which, when freely and perseveringly given, is well known to be a trustworthy remedy in congestive asthma.

Iodide of Potassium is a medicine often of such well-marked efficacy in relieving much of the distress and discomfort attendant upon asthmatic seizures, especially when of a congestive character, that a word may well be said as to the indications for its employment, and the method of its administration. In the case of persons of a rheumatic constitution, and whose breathing is greatly oppressed in damp weather, the iodide is decidedly worth a trial, and it may be given in a commencing dose of 5 grs. combined with the carbonate, or aromatic

spirit, of ammonia mixed in plain water. When the expectoration is scanty and glairy this form appears to suit well, but often it has to be taken perseveringly for as long as ten or fourteen days before its beneficial action is manifest.

With some persons a very small dose of iodide of potassium causes languor and depression, with pain over the eyes, and headache, and for such some other medicine must be found. Iodide of potassium is seldom a good medicine for young children under two years of age. Remarkably good results in the way of curing congestive asthma, complicated with bad attacks of spasm, may be obtained by causing the patient to take the iodide of potassium with ammonia three times in the day, while he takes every night a pill containing ½ gr. of extract of belladonna. The belladonna appears to quicken the circulation through the capillaries of the lungs, and certainly aids the iodide in removing bronchial congestion of passive form. Sometimes the belladonna has to be pushed to the extent of producing some dryness of the throat before its full therapeutic action is brought out.

A patient undergoing this method of treatment will also be helped much by the inhalation of ten drops of iodide of ethyl from a piece of lint whenever he feels the spasm coming on with severity, for it is always best to try and stop the spasmodic seizures at their onset.

A most valuable, and, as far as my own sixteen years' experience goes, a perfectly safe internal medicine, both for spasmodic and congestive asthma, is found in the various preparations of arsenic. Arsenious acid in a dose of 1-30th of a grain, or the liquor arsenicalis in doses of 2 to 5 drops in water, may be given three times in the day after meals.

Comparative experiments make me prefer the arseniate of soda, a salt which is best given in the form of 3 to 10 minims of the liquor sodæ arseniatis. This dose, given in water, or infusion of calumba, I have found wonderfully efficacious in curing nocturnal attacks of bronchial spasm, complicated very often with obstinate chronic bronchitis and yellow thick expectoration. Where inflammatory symptoms and feverishness are present, or where the heart is feeble, preparations of arsenic are best withheld. Blood spitting, too, is decidedly against the administration of any form of arsenical medicine. It is well known that the Mont Dore and Bourboule waters, of such high repute in the treatment of the asthma, owe their virtue mainly to a small proportion of the arseniate of sodium. In catarrhal asthma, as well as in the dry form of the disease, the Bourboule water has proved eminently curative. According to careful analysis, by M. Millot, la Grande Source Perrière de la Bourboule contains a constant quantity of arsenic in the proportion of 7 milligrammes to the litre (1 milligramme = about 1-70th of a grain, 1 litre = 35¼ fl oz.), so that much good may result from what appears a very minute dose of arsenic.

In cases of asthma associated with genuine gout, or with osteoid arthritis, arsenical preparations should be always tried ; they will often agree well and do not run the strength away like iodide of potassium so often does when largely employed in these cases.

I am compelled to pass briefly over the remedial powers of hydrate of chloral, a speedily palliative agent in most forms of spasmodic asthma uncomplicated with any form of organic disease, and where the respirations are noticed to be very hurried and quick. Syrup of

chloral in dose of ½ to 1 drachm in camphor water is often of great temporary service to us, but its habitual employment leads to languid action of the heart and great depression of the system; and if the patient have any kidney disease symptoms of uræmic poisoning may be brought on by the chloral.

I pass on now to speak of Citrate of Caffeine, a safe and useful anti-spasmodic, lately brought prominently forward as a curative agent in asthma, and acting like belladonna, and unlike opium, as a quickener of respiratory action. The citrate (*a*) of caffeine is a white salt, crystallising in soft silky crystals, soluble in water, and for more than twenty years it has been occasionally prescribed in France and America for the relief of neuralgia and sick headache. Quite recently, I see by an article in the *Practitioner*, for January 1879, that Dr. Lewis Shapter, of Exeter, has been using the citrate of caffeine in 3-grain doses with great success as a diuretic in cases of cardiac dropsy.

I am indebted to a distinguished member of our profession, in a northern town, for ample notes of the effect of the citrate of caffeine. I have already referred to this case in Lecture II. For 340 nights out of 365 the patient had to sit up, struggling for breath, and the effect of ordinary remedies may be thus briefly given: burning nitre paper useless, or worse than useless; tobacco or stramonium, smoked *ad nauseam*, slight benefit; chloroform inhalation, transient relief; nitrite of amyl, tried repeatedly and carefully, entirely useless; phosphorus, arsenic, iodide of potassium, no benefit whatever. After this utter failure of all ordinary remedies, it occurred to

(*a*) The fine specimen exhibited before the Society was kindly sent by Messrs. Corbyn and Co.

the patient himself to try the citrate of caffeine, seeing that the use of strong infusion of coffee always gave him some amount of relief. One or two grains of citrate of caffeine were taken at bedtime, dissolved in a cup of coffee ; and if, during the night, asthma seemed about to come on, then an extra grain was at once taken. The effect of this plan of treatment, so far as we can at present judge, seems to be a complete cure of the breath seizures. The last report says that cough, expectoration, and asthma are all gone away together, existence is a pleasure, work a satisfaction, and sleep can be taken at night, or after dinner, without any fear of waking up in a fit of asthma. On one occasion a dose of 4 grs. of citrate of caffeine was taken at once, but this seemed too much, as wakefulness at night was the result. In another case, that of a gentleman who had been asthmatic for twenty years, and who had tried arsenic and other remedies with no curative effect, but who had derived benefit from inhaling the iodide of ethyl, we tried the citrate of caffeine with the following results.

Two grains were taken every afternoon for fourteen days with no great effect, but one afternoon, being almost exhausted by a prolonged attack of spasm that resisted the action of chloroform and other remedies, he took four grains of citrate of caffeine in a cup of coffee ; the effect was immediate relief to the spasm, and three hours' good sleep in the chair. On subsequent occasions, when the citrate was taken, sleep came on, and the patient considered the drug as a very powerful sedative. I expect it is, as put forth by Dr. Milner Fothergill in his recent Prize Essay, that the citrate removes the irritation of the nerve centres, and when this cause of excitement and want of sleep has abated, natural repose soon comes on.

The more purely spasmodic the asthma, the more likely is the patient to get benefit from the citrate of caffeine. I have tried it in congestive asthma, in the case of one who was ordinarily much relieved by iodide of potassium and belladonna, and it seemed of service in easing the more immediate spasm, so that, aided by iodide of ethyl, the patient in a day or two was restored to his usual health and activity.

In true bronchitic asthma, where a subacute inflammation of the air passages is the cause of excitation of the nerve filaments in the bronchial muscles, I usually find it necessary to give for a few nights a pill containing pilula hydrargyri and pulvis scillæ. When the patient is feverish, his cough and dyspnœa great, and his urine loaded with lithates, such a pill is most valuable ; especially if, during the day, a mixture be given containing some of the hypophosphite of potash or soda.

Congestion, effusion, or exudation, about the lining membrane of the bronchial tubes, is more certainly prevented by this method than by any I have as yet tried.

Before concluding, I am very anxious to say a few words regarding the management and medication of that large class of asthmatic people who come to consult us on account of asthma, complicated with chronic bronchitis, emphysema of lungs, weak heart, and impeded play of diaphragm, for experience has taught me that we may do great things often for these apparently unpromising cases.

The first thing is to diet the patient. To this end he must be put on a light nutritious, non-bulky, plan of feeding ; he must give up eating suppers, and must par take sparingly of liquids with his meals. In very many cases total abstinence for a time from every form of

alcohol has a surprisingly good effect, and increase of vigour and activity is such as to call forth expressions of the greatest delight from the patient. In other cases a small quantity of Manzanilla sherry, or a little weak spirit and water with meals, and at no other time, may be advisable. Malt liquors I believe to be uniformly bad ; and the amount of asthma contained in a glass of of old ale and a bit of bread and cheese would hardly be believed by anyone who had not had an opportunity of making personal experiment on the subject.

Some of these patients who complain of attacks of spasmodic asthma at night, and of cough and expectoration every morning on rising, have an aspect of robust health, and are great at eating and drinking. In many such an antecedent history of gouty parents is a prominent point, and the patients themselves, without breaking out in a genuine attack of *Podagra*, after the habit of their fathers or grandfathers, exhibit in the excited and often violent action of the heart, and in the ready production of dyspepsia, with turbid and irritating urine, unmistakeable evidence of a genuine gouty diathesis.

In the violent and persistent asthmatic seizures of an individual of this kind of temperament, it is a good plan to try the effect of cutting off his supply of nitrogenous aliment for a time, so far as to feed him mainly on eggs, milk, and farinaceous food, to the exclusion of meat. The patient does not always approve of this method of cure, but if he will try it but for a short period his liver will have time to get rid of the excess of carboniferous and albuminoid matters that are oppressing it, and the renal organs will also eliminate excess of effete material from the blood, and as this takes place a feeling of relief and elasticity will be experienced by the patient

eminently conducive to the removal of his asthmatic troubles.

One of the Abbots of the Monastery of La Trappe, was entirely cured of a most obstinate asthma by the rigid diet of his brotherhood, involving complete abstinence from meat.

A congested and plethoric state of the vessels of the abdominal viscera can be, to a great extent, removed by a steady course of the Carlsbad or Friedrichshall water, aided now and then by a small dose of mercurial pill, and thus the diaphragm is greatly helped in its action, and free respiration promoted.

The abdominal functions being thus regulated by attention to diet and the use of medicines appropriate for the purpose, if we still find the asthmatic breathing very distressing, the chest distended, the heart's dulness obscured, and that organ's impulse very perceptible at the epigastrium in consequence of its lowered position in the chest, then we may use small doses of the tincture or extract of nux vomica as a promising medicine. Great prolongation of expiration, I have usually found an indication for this remedy. This indication for the use of the nux vomica was well illustrated by an interesting case recorded in the *Dublin Quarterly Journal*, May 1860, by Dr. J. F. Duncan. Eliza Simpson, a married woman, forty years old, had a hard cough, frothy expectoration, and intense dyspnœa. She attributed her sufferings to a cold caught in the snow twelve months previously. The chest was of a rounded form, hyper-resonant on percussion, and loud sonorous cooing râles were audible in every direction. On inspiration there was no true expansion, the whole thorax moving up and down as if ribs and cartilages were united into one compact structure. The expiration, as measured

by hand and stethoscope, was judged to be three-times as long as was the inspiration. For treatment a variety of expectorants were tried without success, though a mixture containing nitric acid seemed to agree, and to be of some little service. December 26th : A current of electricity was passed through the chest from the side of the neck to the pit of the stomach, but was productive of no benefit. Dec. 27th she was ordered three times daily a pill containing half a grain of extract of nux vomica and one grain of ipecacuanha. The effect of this pill was surprising and unexpected ; she was able to lie down and sleep all the night, and continued to improve steadily. The pills kept the bowels regularly open, promoted expectoration, increased appetite, and procured sleep. Auscultation showed a gradual loosening of the bronchitic râles, and the expiratory murmur was less prolonged. January 6th she left the hospital perfectly recovered. The opinion expressed here was that protracted inflammation had gradually induced a weak and paralytic condition of the bronchial muscle ; hence the very prolonged expiration. The breathing appears to have been very early and severely affected. Probably these early attacks, some twelve months before the patient came under observation, were of a true spasmodic nature, and by degrees, as the muscle became worn out by prolonged irritation, the spasm gave way to paralysis. There could not have been any actual degeneration of muscle, seeing how rapid and complete was the recovery under the influence of a nerve tonic medicine.

As has already been stated, it is probable that in many of these cases of paralytic dyspnœa with over-full and distended lungs, and prolonged expiratory breath sound, the paralytic condition is due to failure of power in the

vagus nerve rather than to degenerative change in the bronchial muscle and air vesicles. In the case of such a patient as the one just noted, who was but forty years old, it is quite possible that defective power in the vagus nerve may have been one cause of the paralytic dyspnœa. Such cases may be regarded very hopefully, for they usually improve under the influence of small doses of extract of nux vomica, or of strychnia, in combination with nitric or phosphoric acid.

In the paralytic dyspnœa due to an atrophous emphysema of lung in one who is advanced in life, the prognosis is by no means so favourable, for such a patient may go into a phthisis with destruction of lung substance, or the heart may participate in the same degenerative processes which have involved the air cells and bronchial muscles, and the patient may die from exhaustion of heart power. In such a case no remedies have seemed to me better than hypophosphite of soda or lime, alternated with tincture of iron and liquor strychniæ. Arsenical preparations also are of some service, provided they do not disturb the action of the heart.

It may not be out of place to enlarge somewhat on the treatment of cardiac asthma. Cases of this disorder are recognised, when confirmed, by the gasping character of the dyspnœa, and its tendency to come on after the slightest exertion, or after any exposure to sudden cold. There is more or less of a livid, congestive look about the patient, the feet may be œdematous, and the urine scanty, thick, and high coloured. The respiratory murmur is usually of a harsh character, with little or no sign of prolonged wheezy expiration. The heart's impulse is diffuse, often irregular, perceptible by finger at epigastrium, and on listening the first sound is dull and toneless.

If a patient of this class has been taking abundance of highly nitrogenous aliment in the form of mutton chops and extract of beef, with a fair supply of alcohol, it may be well to begin the treatment by stopping some of those good things, for possibly the blood is over-loaded with the products of imperfect assimilation, and such a condition of things, commonly spoken of as suppressed gout, most undoubtedly increases the irritability of the cardiac muscle, and before long will add renal disease and granular kidneys to the patient's already sufficient list of troubles. Rusks soaked in milk for breakfast, and a light dinner in the middle of the day of fish, chicken, or game, with some very weak brandy or whisky with water, and a cup of milk, or some sandwiches of meat and bread at bed time, after a light meal about six in the evening, will be a good change. At the same time an alkaline tonic, or an alkaline saline aperient, will aid to relieve the kidneys and liver, and after a week or so the urine will be clearer, the appetite stronger, and the nights much less uncomfortable.

If now we find the heart very feeble and irregular in action the infusion of digitalis, in doses of one or two drachms three times a day, will often improve the breathing in a remarkable way. Nux vomica, strychnia, and iron, are also of use, but the effect of the first two is not so marked in cardiac asthma as it is in the paralytic dyspnœa recently described.

In treating cardiac asthma it is important that the patient take small meals at frequent intervals, and it is best to avoid the use of much fluid aliment.

It is in cases of confirmed asthma with emphysema of lungs and weak dilated heart, where so much benefit is said to be obtained from the use of compressed air inha-

lations. My own experience of this method of treatment is not large, but in Paris, Frankfort, and other places on the Continent, the system may now be tried under a very perfect management of the apparatus, and from what I have observed of patients who have made trial of the compressed air bath, it seems of service to persons decidedly emphysematous in the lungs, and who suffer from coldness of the extremities and over-fulness of the venous system. In one instance the effect of the bath on on elderly gentleman, whose case presented the above-described symptoms, was to produce a very free expectoration, with great subsequent ease to his respiration. At the same time a young patient of my own who had been recommended to try the bath for pure spasmodic asthma, assured me that after twenty or thirty baths he was in no way relieved.

Independently of the effect of increased pressure on the surface, there is no doubt but that by breathing the compressed air a larger quantity of oxygen is conveyed to the blood; hence the remarkable efficacy of these compressed air baths in curing cases of very obstinate anæmia. (*a*)

In those numerous instances where difficulty of breathing is made worse by the recumbent posture, on account of the pressure of the abdominal viscera upwards against the diaphragm, and where necessity often compels the prolonged maintenance of an upright position till the patient is quite exhausted, very great relief can be gained by the use of Dr. George French's respiratory brace. This contrivance consists of a cross-bar, from the extremities of which hang two loops of strong elastic web-

(*a*) See Report of the Compressed Air Bath in "Notes on Asthma," third edition, page 150.

bing for the support of the shoulders. A broad band encircles the head, and is steadied by guys stretching across on both sides to the upright elastic supports. The apparatus is suspended by a pulley or ring from the ceiling. When the patient is tired of suspension by the shoulders, he can easily shift his position, and rest his elbows in the elastic loops or slings. By saving muscular effort to the asthmatic patient, sleep is more readily induced, and irritability of the spinal cord and nerves is decidedly subdued. The use of sedatives and narcotics is thus happily superseded. The brace is made by Geo. C. Frye, Surgical Mechanician, Congress Street, Portland, Me.

The local effect of certain inhalations in bronchitic asthma is often good. In cases of great tightness and distress at the chest, a warm, steaming inhalation from Dr. Lee's steam draft inhaler is usually soothing, especially if the larynx be very irritable. The steam of the water may be medicated by the addition of from five to ten drops of creasote, or thirty drops of tincture of benzoin, with ten of spirit of camphor. The steam draft inhaler has the great advantage that the temperature of the inhalation can be readily modified by opening or closing the aperture for the air draft.

In bronchitic asthma I know of no better spray inhalation than that of ipecacuanha wine, recommended first by Dr. Sydney Ringer. The wine should be diluted with from one to two parts of distilled water, and filtered, that it may work freely in the atomiser. The patient must then inhale the spray, and the management should be such that the blast from the atomiser corresponds with each inspiratory act on the part of the patient At the first sitting he should not take more

than twenty doses or inspirations of the spray. The usual effect of this treatment is greatly to relieve dyspnœa, and mitigate cough and expectoration. The unusual effects are sudden and marked increase of dyspnœa in a few individuals who have a peculiar susceptibility to the action of ipecacuanha ; and at times I have known vomiting occur some short time after the use of the spray, in consequence of the wine collecting in the mouth and being swallowed by the patient. This contingency is easily avoided by making the patient spit the collected wine out of his mouth.

The antiseptic inhaler invented by Dr. Sinclair Coghill, of Ventnor, is often a great comfort to those who have bronchitic asthma. This instrument, as made by Maw, Son, and Thompson, is a plated cup perforated for the admission of air, and containing within it a second perforated plate, while between the two is interposed a thin layer of wool on which a few drops of the inhalant are sprinkled. The apparatus thus prepared is secured by an elastic band over the patient's mouth, and it has proved a great boon to many of my hospital, and other, patients who have had to encounter the cold morning air.

A mixture made of a drachm of ether, creasote, and carbolic acid, with distilled water to complete one ounce, is recommended by Dr. Coghill, and to its value I am able to bear my testimony.

ADDITIONAL NOTE ON HAY ASTHMA AND ITS TREATMENT.

Since my delivery of the Lettsomian Lectures I have been favoured with a communication from Dr. Blackley on the question of congestion and flux in relation to Hay Asthma that I wish to place now before my readers. In the frequent references made by me to the valuable researches of Dr. Blackley as to the cause of hay asthma I stated that he considered bronchial congestion to be the sole factor of the dyspnœa. This expression, Dr. Blackley says, "hardly expresses correctly the opinion I hold. Pollen does not always cause congestion of the mucous membranes with which it comes in contact, but it almost always causes exudation of serum in the sub-mucous connective tissue. If pollen be applied to the abraded skin it does not cause any congestion of the vessels of the corium; its action is expended in producing effusion of serum into the subcutaneous areolar tissue."—(Pp. 84-85 of Dr. Blackley's work.)

When pollen is applied to a mucous surface, then it is the serous fluid in the sub-mucous connective tissue which Dr. Blackley views as the chief productive cause of the asthmatic paroxysm.

In the same communication I read with interest, though without surprise, that close observation and increased experience have convinced Dr. Blackley that asthmatic paroxysms do occur in a spasmodic manner; but that these are due *only* to an actual contraction of the bron

chial tube from spasm of the circular bronchial muscles is a point on which Dr. Blackley is not yet certainly convinced.

With regard to the treatment of hay asthma and summer catarrh, I may here add a few remarks. During bright sunshine the patient should seclude himself in a cool and darkened room, for certainly many cases of hay asthma are notably intensified by exposure to the light of the sun, and there are those who attribute a kind of congestive hay fever solely to the effect of sunlight. Dr. Wallace, of Parsonstown, has supplied me with one illustrative instance, and a few have come directly under my notice, where a feverish condition, with some dyspnœa, came on in individuals apparently quite removed from all contact with hay or flowering grasses.

Dr. Pirrie, who some years ago drew attention to the distinction between hay asthma and this congestive solar fever, attributed the symptoms to a paresis of the nervous centres brought about by the rays of the sun. The complaint is best treated by seclusion from the solar rays, while internally the patient may take such a draught as the following, three times daily :—

℞ Quiniæ sulphat., gr. j.
Acidi hydrobromici, m. xx.
Aq. camphoræ, f. $\bar{3}$ j. Mix.

Another useful medicine is the liquor ammoniæ, or else eau de luce (*a*), in doses of five to ten drops in milk.

In ordinary hay asthma these same medicines are of

(*a*) ℞ Mastic, ʒij.
Sp. vin. rect. ʒix.
Ol. lavandulæ, ♏xv.
Liq. ammon. Fort. ʒxx. Solve.

service, as also is the iodide of potassium, with two or three drops of Fowler's arsenical solution. When there is puffiness and œdema about the eyelids a dose of five or ten minims of tincture of cantharides, with some spirit of nitrous ether, I have found beneficial, and I have seen the external œdema subside speedily under its administration.

Seeing what good evidence we have of the local irritant action of pollen as the cause of hay asthma, we naturally look for aid in local medication by means of sprays and inhalations. Sulphate of quinine in the proportion of ten grains to a pint of distilled water may be used as a spray. Solution of salicylic acid also has been recommended, but I should think it probable that this acid would combine with some of the salts present in mucus, and then any antiseptic power it may possess would be destroyed.

The inhalation of the diluted vapour of chlorine and sulphurous acid gases mitigates the discomfort due to summer catarrh, and I expect the iodide of ethyl vapour will also prove valuable for the same purpose, though I have not seen much good done by the vapour of iodine itself. Excessive nasal irritation may be relieved by drawing some camphor water through the nose, and also by applying some of the belladonna ointment of the B.P., or an opium ointment, made of 1 extract of opium to 9 of simple ointment, to the interior of the nostrils. Chloral hydrate, in doses of five to ten grains, may be taken to relieve sposmodic dyspnœa, and a spray of this medicine, in proportion of five to ten grains to one ounce of distilled water, inhaled, will be another means of subduing excessive irritation of throat and nostrils.

Croton chloral, more correctly called butyl chloral hy-

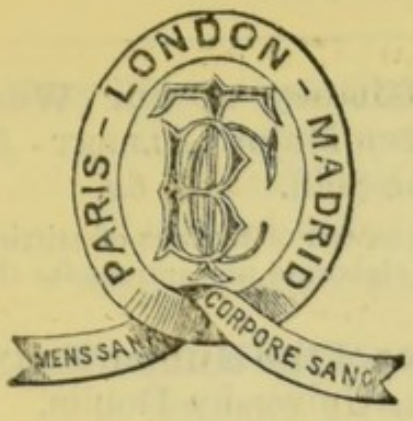
drate, appears a remedy well worth trying in hay asthma. I have given it in neuralgia of the fifth nerve, with very good effect, and from what we know of its remedial action in photophobia, and in spasmodic cough, we may certainly expect some good from its administration in hay asthma. The dose may range from three to five grains three times a day. A large dose of fifteen to thirty grains acts as an hypnotic and produces sleep.

The crystalline substance known as Thymol, obtained from the oil of thyme, is, in strong solution, an active caustic, but diluted it acts as a very powerful agent to arrest fermentation, germination, and putrefaction. The best form for inhalation appears to be that of the Throat Hospital Pharmacopœia, which is as follows :—

℞ Thymol, gr. xx.
Spir. vin. rect., ʒiij.
Mag. carb. levis, gr. x.
Aq. ad ℥iij. Mix.

One teaspoonful in 20 oz. of water at 150° for each inhalation.

All these plans of treatment for hay asthma are at the best but palliatives, persons experienced in the complaint generally acting on the practical rule that prevention is better than cure, and taking refuge from their enemy either on the sea coast, or better still, by forsaking the land and going for a voyage in a yacht.



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