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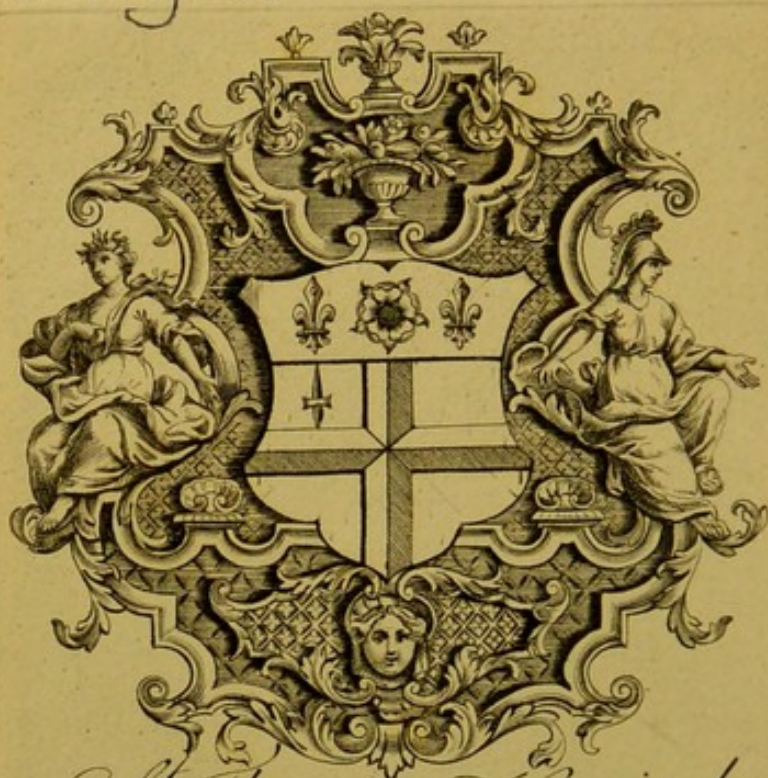
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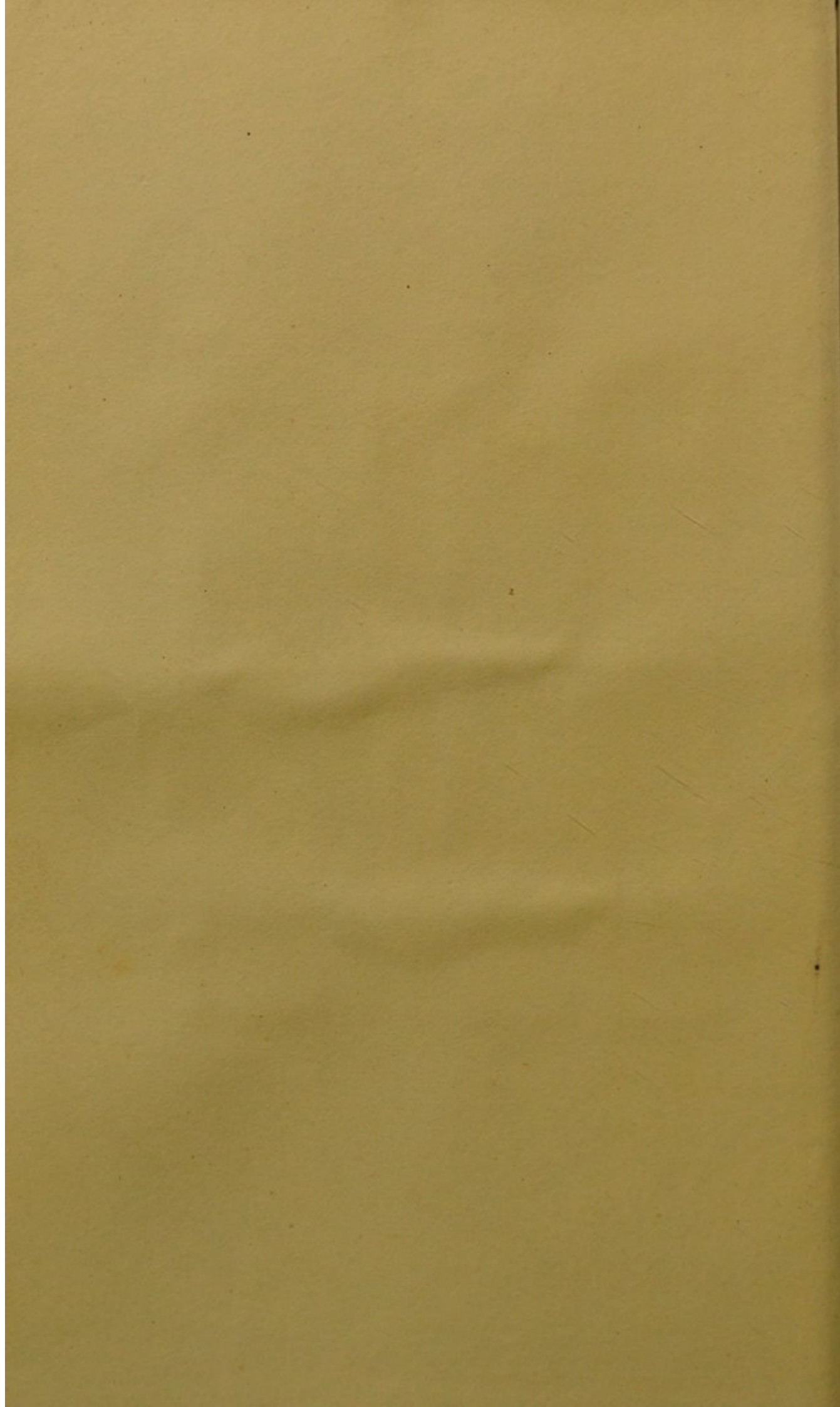
HASTINGS, CHARLES.

A TREATISE ON INFLAMMATION...
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TREATISE

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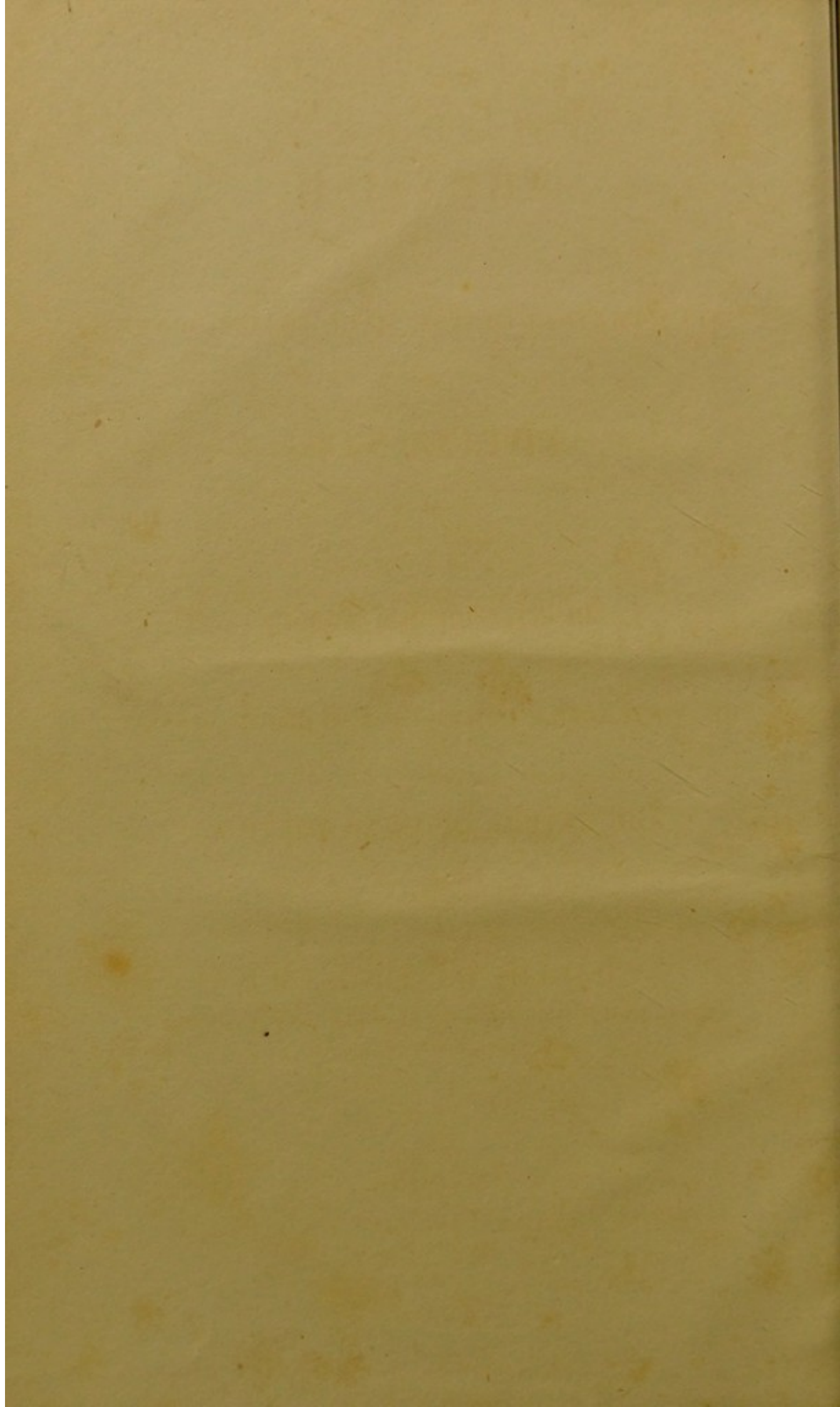
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A
TREATISE
ON
INFLAMMATION OF THE MUCOUS MEMBRANE
OF
THE LUNGS.

TO WHICH IS PREFIXED,
An Experimental Inquiry
RESPECTING
THE CONTRACTILE POWER OF THE BLOOD VESSELS,
AND
THE NATURE OF INFLAMMATION.

BY
CHARLES HASTINGS, M.D.

*Physician to the Worcester Infirmary; late President of the Royal Medical
Society, Edinburgh, &c.*

LONDON:
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LONDON:

PRINTED BY J. MOYES, GREVILLE STREET.

TO
A. P. WILSON PHILIP, M.D. F.R.S.E.

Fellow of the Royal College of Physicians, Edinburgh, &c.

WHOSE ENDEAVOURS
TO ADVANCE MEDICAL SCIENCE

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PREFACE.

IT will be admitted, that the effects of inflammation vary considerably in the different textures of the human body, and that it is of the first importance accurately to distinguish the morbid changes which occur in these several textures when inflamed. But so intricate is the animal economy, that a minute acquaintance with diseased structure is not easily obtained; and the imperfection of our pathological knowledge, in this respect, is universally felt and regretted.

Unfortunately, as regards inflammatory diseases of the pulmonic system, the truth of the above observations is but too obvious, most authors being content to treat of inflammation of the serous, cellular, and mucous membrane of the lungs under one common title, Pneumonia.

Until the appearance of Dr. Badham's essay on Bronchitis, in which he has given an excellent outline of this genus of diseases, there was no separate work, in our

own language at least, on inflammation of the mucous membrane of the lungs.

The author of the following treatise has, for some years, had frequent opportunities of witnessing cases of this description, and of ascertaining the state of the lungs after death; so that he has gradually accumulated many facts, which appear to him calculated to throw additional light on this interesting though still obscure disease. He has, therefore, arranged the cases, and drawn such conclusions from them as they seem to afford, under the impression that they may not be altogether useless to the public.

The preliminary chapter appears a necessary prelude to the treatise on Bronchitis; for when such very opposite doctrines respecting the nature of inflammation are held by authors of the first eminence, every one who writes on inflammatory diseases is, in some degree, called upon to state the doctrine he embraces, and his reasons for adopting it.

The author does not feel any apology necessary for the length of the introduction. So many pathological inquiries are

connected with the admission or rejection of an irritable power in the blood vessels, that few will refuse to devote some time to the investigation of this long agitated question.

The introduction and the preliminary chapter are already in some degree before the public: the former is the subject of the author's inaugural dissertation; and the substance of the latter is contained in a paper read by him some time ago to the Medical Society of Edinburgh.

ERRATA.

Page 126, in Note, *for* Nosocomis, *read* Nosocomio.

— 138, line 20, *for* vesification, *read* vesication.

— 228, — 15, *for* 1819, *read* 1814.

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AN
EXPERIMENTAL INQUIRY, &c.

INTRODUCTION.

INFLAMMATION, in its multifarious forms, is a daily occurrence in medical practice; it is surely, therefore, incumbent upon us to endeavour to elucidate some of those circumstances in its history which have not yet been explained. But as the blood vessels are the agents by which most of those changes in an inflamed part are effected, it is quite clear, that a rational pathology of inflammation must rest on a previous knowledge of their healthy functions.

The points on which physiologists differ most, are the kind and degree of contractility possessed by the blood vessels. It is more important to have these determined, since the most opposite opinions respecting them are held by men whose distinguished talents claim the greatest respect.

In discussing the contractility of the blood vessels, much difficulty has arisen from the indefinite expressions employed by writers. It therefore seems absolutely necessary, in the first place, to make a

few observations on certain terms which are become familiar in treating on this subject, and which are not always used with accuracy, nor, perhaps, in the same sense. The terms alluded to are irritability, sensible organic contractility, insensible organic contractility, and tonicity.

Haller, as is well known, after unwearied assiduity in experiments, published two essays on the sensible and irritable parts of animals, which have been the foundation of all our knowledge of irritability. In these experiments he paid attention to the degree in which living parts contracted on the application of stimuli, and hence deduced the intensity of this property in the several parts.

Bichat, aware of the obscurity which hung over this subject, endeavoured to render the knowledge of the vital actions more precise, by dividing contractility into animal and organic. The former he describes as essentially subject to the will, and having its principle in the brain, and its exclusive seat in the voluntary muscles; the latter, as having its principle in the moving organ itself, and as being a stranger to the influence of volition, and as giving rise to the phenomena of digestion, circulation, secretion, absorption, and nutrition. But, that he may be still more accurate in his account of the contractile power, this indefatigable physiologist makes two subspecies of organic contractility; sensible, and insensible. The former, he thinks, is exemplified in the visible actions of the

heart, stomach, and intestines; whilst the latter belongs to the excreting tubes, and is evinced in their action on the fluids contained in them. These two subspecies of organic contractility do not arise from different principles; the one is but the extreme of the other, and these extremes are connected by insensible gradations. These gradations are well marked in the circulating system, where the heart and the capillary vessels form the two extremes of contractility, and the larger blood vessels are the mean between them. Irritability, he believes, is not peculiar to muscle. It is true, muscles possess the maximum of organic contractility, but every living organ acts as they do, though in a manner less apparent, upon the excitant, when artificially applied, or on the fluid, which, in the natural way, is carried to it for the purpose of supplying the matter of secretion, nutrition, exhalation, or absorption*.

It appears, from this short sketch, that Bichat maintained there was a difference in kind between the animal and organic contractility; but by sensible and insensible organic contractility he only understood different degrees of the same property.

Dr. Parry has more lately treated on the arteries, and has used the term tonic power to express their vital power. "This power," he observes,

* *Physiological Researches on Life and Death*, by Bichat, translated by Good.

“ is, however, so far different from that which
“ in muscles is called irritability, that an artery
“ suffers no degree of contraction from a great
“ variety of chemical and mechanical agents, called
“ stimuli; for none of these substances, applied to
“ any part of an artery, will cause it to contract*.”

This able physician also observes, that he intends by it to denote “ a mean state of contraction
“ existing during health, and capable of being
“ increased by certain causes, and of being
“ diminished or lost by certain diseases.”

It would appear, therefore, that Haller, and the other writers quoted, concur in using irritability to express that vital power in any living part, by which it contracts or shortens its fibres when touched by a stimulus. In this sense it is also used by the celebrated Hunter, and others of great note; and in this acceptation it is employed in this Inquiry.

Having endeavoured to fix the precise acceptation of those terms which are used to express the vital power of the blood vessels, the next object is to determine whether they assist in the circulation of the blood.

At first sight it appears strange, that, although nearly two centuries have elapsed since the brilliant discovery of the circulation of the blood, it yet remains to be decided what part the heart per-

* Parry on the Pulse, page 52.

forms in that important function: but when we more closely examine the nature of the problem to be solved, we see the intricacies of the subject, and are enabled to appreciate the difficulties which human genius has had to contend with, in endeavouring to explain the offices of this organ.

It is thought by some writers that the contraction of the ventricle is alone adequate to circulate the blood; others, on the contrary, believe that the blood vessels possess an inherent irritability, by which they contract on the blood, and preserve the impulse which at first gave it motion. The supporters of the latter hypothesis are numerous, and names of the highest repute sanction this view of the question. Independently of all other considerations, they conclude that the immense force with which the blood must be propelled from the heart, to enable it to permeate the myriads of small tubes through which it has to pass, would require such an amount of contractile power as could hardly be conceived to exist in that organ.

In discussing this point, therefore, writers have always had recourse to both a negative and positive mode of proving a contractile power in the blood vessels. They have shown that the heart is not adequate to the circulation of the blood; and, by experiments on living animals, have demonstrated a vital contractility in the arteries and veins.

In order to calculate whether the impetus with which the blood is thrown from the ventricle into

the aorta, is sufficient to distribute it to those millions of minute and remote vessels through which it has to pass, before returning by the veins to the right auricle, it is necessary to assign the precise force with which the blood is impelled into the great artery, and also the exact momentum any given column of blood should receive at the heart to enable it to circulate, with the wonted celerity, in a minute capillary tube, unassisted by any contraction in the blood vessel. But, unfortunately, even an imperfect knowledge of either of these necessary steps in the investigation is not to be obtained; for, among those who have endeavoured to ascertain the sum of the heart's action, there is such glaring contradiction, that no reliance can be placed on their calculations. Dr. Whytt's opinions on this subject were founded on Dr. Hales' experiments; and he believed that the real remaining force of a globule of blood, when arrived at a red capillary vessel, was not equal to its own weight. At any rate, the motion of the blood, under such circumstances, must be very slow.

But so far from finding the motion of the globules very slow in the minute vessels, which must necessarily happen if the heart were the sole agent in the circulation, actual experiments demonstrate that these globules glide along with considerable rapidity; with so great rapidity, indeed, that, when magnified by the microscope, the eye can scarcely follow them. Verschuier observed this in his

experiments*; and Dr. Thomson found the globules moving so briskly, that it was with difficulty he followed them through any determinate space†, and in experiments on frogs the author of this Inquiry has frequently observed the same thing.

In every rational investigation wherein it is impossible to arrive at any positive evidence, we should incline to that side of the question which appears most consistent with facts. In this view of the subject, the idea of the impulse given to the blood by the ventricle being the sole cause of its motion, to say the least, seems very questionable.

It is the consideration that the contractile power of the ventricle is inadequate to the circulation of the blood, which has induced some late physiologists to take a new view of the functions of the heart. Dr. Wilson, Dr. Carson, and others, are anxious to establish the fact, that a dilatation of the chambers of the heart follows their contraction, by which a tendency to vacuum is formed for the veins to unload themselves. They are not, however, agreed as to the mode in which this tendency is produced; some of them contending that the structure of the heart is alone adequate to the purpose, whilst others think the assistance of the elasticity of the lungs necessary.

Dr. Carson ranks amongst the latter. After

* Verschuir de Arteriarum et Venarum Vi Irritabili, p. 9.

† Thomson on Inflammation, p. 79.

having explained the effect which a dilating power in the chambers of the heart would have upon the motion of the blood, he says: " In searching for
" the causes by which the chambers of the heart
" were dilated after contraction, it was ascertained,
" that this condition of the organ was, in part, to
" be ascribed to the form and position of its fibres;
" in consequence of which, simple relaxation was
" accompanied by a certain degree of dilatation,
" but particularly to the supporting of a part of
" the atmospherical pressure that would have
" rested on the convex surfaces of the heart, or
" its envelope, by the resilient or collapsing effort
" of the lungs *."

This view of the subject is highly ingenious, and is supported by the writer with perspicuity. But it is only in the more perfect animals that this cause can be supposed to influence the motion of the blood, because, in many of the inferior animals, the lungs are so situated, and so devoid of elasticity, that they cannot affect the motions of the heart. Besides, in the foetus, the motionless state of the lungs altogether prevents any such co-operation.

Dr. Carson endeavours to obviate this difficulty, by substituting the action of the diaphragm for that of the lungs; but this supposition is quite gratuitous, and unsupported by any proof.

* Carson on the Motion of the Blood, p. 147.

Hence Dr. Carson's theory of the circulation is only applicable to some classes of animals, and leaves us in the same perplexity with regard to the motion of the blood in the most numerous of the animal kingdom. If Dr. Carson's view of the circulation were not beset by the difficulties which have been stated, it would still behove us to inquire how far facts, relating to the venous circulation, support his opinions.

Those writers who regard the heart as a suction pump, conceive that "the main support and preservation of a venous current of blood to the heart depends upon a vacuum being momentarily provided where the veins may unload themselves*." If the main support of the venous current depended on a tendency to a vacuum being momentarily produced in the heart, it is quite evident that the motion of the venous blood could not be in a continued stream; it would move much more quickly during the diastole of the auricle than during its systole, because it is only during the dilatation of the auricle that the principal cause of the venous circulation operates. But the microscope shows us that the blood in the veins moves rapidly, in an uninterrupted stream, without its motion being at all quickened during the dilatation of the auricle. Other facts may be stated equally hostile to the hypothesis.

* Wilson on the Moving Powers employed in the Circulation, p. 35.

If a ligature be applied to a vein, the blood accumulates, which should not happen if the tendency to vacuum at the heart gave rise to the circulation in the veins, because the gravity of the blood, according to the view of Dr. Carson, should direct it onwards, through the numerous anastomosing vessels, towards the auricle, where all atmospheric pressure, during its diastole, is removed.

From this reasoning, and from a consideration of the evidence by which Dr. Carson attempts to prove that a tendency to vacuum is formed in the heart, the author is induced to believe, that the ingenious arguments brought forward by that gentleman in support of his theory, have given it a plausibility to which the facts already ascertained do not, by any means, entitle it. Indeed, the knowledge we at present possess, so far from countenancing such opinions, seems completely at variance with them.

With regard to the direct evidence by which the contractility of the blood vessels is supported, this branch of the inquiry presents itself under the following heads:—

I. The consideration of the facts relating to the larger arteries.

II. The description of those phenomena which are observed in the capillary vessels.

III. The notice of those appearances which favour the supposition that the veins are not devoid of an active contractility.

I. As to the facts connected with the larger arteries, it may be necessary to give a short previous description of their three coats.

The exterior, called by Haller the *tunica cellulosa propria*, is the firmest and most dense of the three; it is also the whitest in colour. The principal power of resistance is derived from this coat; it is very elastic, and is composed of condensed cellular membrane, externally more lax, internally more and more compact.

The middle coat is composed of many firm dense fibres, which are disposed in strata around the arteries; they are of a fleshy nature. *Monro*, *Haller*, *Ludwig*, and many others, agree in calling this coat muscular. *Monro* remarks, that “What really deserves to be called the first proper coat of the arteries, is the muscular, or tendinous, which, in the human body, at least, consists of auricular fibres connected strongly together*.” *Haller* also calls them fleshy fibres, and says they possess every requisite for muscular action†.

But there are other eminent writers, who conceive that the structure of this coat does not at all resemble muscle, and that it only possesses an

* *Monro*, primus in the *Edinburgh Med. Essays and Observations*.

† In arteriis majoribus musculosam carnem descripsi, nihilque abesse volui quo musculi polleant. *Halleri Opera Minora*, p. 490.

elastic property. Haller and Ludwig mention several authorities; and Bichat and Berzelius have since maintained a similar doctrine.

Bichat has compared the changes which this coat undergoes by the action of various agents, with those which parts confessedly muscular undergo when acted on by the same agents. He has found that the changes manifested in these two cases are by no means similar, and hence derives the non-muscularity of the arteries*. The total inapplicability of this reasoning is evident from the great diversity which is displayed in the structure of muscles in different animals. How little, for example, does the nature of those muscles which enable the swift hare to evade the chase of its pursuers, resemble the structure of those by which the sluggish snail slowly transports its little tenement over the small space of ground it is destined to travel.

Berzelius, in his inquiries, has had recourse to chemical analysis, and, by the most cautiously conducted experiments, has not detected any fibrine in the middle coat. Hence he concludes, that this coat cannot act as a muscle†. But the force of this argument is completely lost, when it is recollected that the muscles in the same animal differ

* Elle forme un tissu à part dans l'économie, tissu qui a des caractères exclusivement distinctifs. *Anatomie Générale*, vol. ii. p. 283.

† Berzelius on Animal Chemistry.

much in structure, according to the office they have to perform. This obviously appears when we compare the fibres of the deltoid muscle with those of the urinary bladder, of the stomach, and of the intestines. Moreover, the uterus, which of all parts in the body evinces the most powerful contractility, has never been shown to possess fibres similar to those which are demonstrable in the muscles of voluntary motion.

From what has been stated, it appears that irritability resides in parts, the fibres of which differ widely from each other: the fibres, indeed, seem to vary with the nature of the contraction they have to perform in their respective organs. Embracing, therefore, this view of the subject, the author is inclined to regard the pale red fibres which encircle the arteries, and constitute their middle coat, as admirably suited, by contracting on the contained fluid, to lessen the calibre of the vessel, and that they are such as may be expected in a canal which is intended to exercise a variable contractility.

The inner coat, lining the cavity of the arteries, is highly polished and smooth, and is connected to the middle coat by cellular substance.

Having considered the structure of the larger arteries as much at length as seems necessary in this Inquiry, the question follows, In what manner are they affected by stimuli? Many eminent men have contributed to our knowledge on this subject. Amongst others, we cannot pass unnoticed the

works of Becquet*, Gorter†, Glisson‡, and Senac. The treatise of the latter, on diseases of the heart, contains many valuable facts which bear upon this point. He says, “Lieez l’aorte et pincez la, elle
 “ fremit, elle se met en contraction: tous ces
 “ rameaux après la mort même conservent cet
 “ agent ou ce mobile qui anime le cœur; quand
 “ les chairs des animaux palpitent, les canaux
 “ artériels palpitent de même; qu’on les dépouille
 “ des chairs qui les environnent, on y verra de
 “ mouvemens alternatifs, l’irritation augmente ces
 “ mouvemens et les entretient||.”

Haller seems to have doubted whether he should refer the arteries to the class of irritable parts. In his Essay on Irritability he declares, that although he cannot absolutely deny the irritability of arteries, yet he does not at all see that it is confirmed by experiments. Notwithstanding this declaration, in his *Elementa Physiologiæ* he states that the larger arteries are in some degree irritable§.

The famous Zimmerman, who was the disciple

* Dissertationes Anatomicæ.

† Exercitationes Medicæ de Motu Vitali.

‡ De Ventriculo.

|| Senac, Traité de Structure du Cœur, p. 227.

§ Hæc ita decet proponi, ut ne suprâ verum aliquid addamus.—Musculosas arteriarum majorum fibras distentas se restituere non est dubium; neque carnem naturam suam contractilem hic deponere æquum est suspicatu.—Halleri *Elementa Physiologiæ*, tom. ii.

of Haller, published an inaugural dissertation on irritability. He relates in it three experiments on the arteries of dogs*, in which he applied sulphuric acid to the denuded vessels, and in two of the three examples contraction was produced. He attributes the non-contraction in the last case to the weakened state of the animal; and he adduces this as a strong presumptive proof that the contraction in the two others was not produced by the corrugation of the acid. Besides the testimony of these writers, Dr. L. Bikker† and J. J. Vandembos‡ affirm that they detected perfect irritability in the aorta by the electric aura; and Van Geuns asserts that he saw, when this stimulus was applied, so much motion in the carotid, that no doubt remained with him of its possessing a muscular power. But of all our predecessors, Verschuir is the most accurate on this point. His thesis contains most unanswerable results. He has related twenty-one experiments, which he performed on the larger arteries of dogs and other animals. In all of them, after dissecting away the integuments covering the arteries, he irritated the vessels with a scalpel, and observed whether any contraction was produced.

* Zimmerman de Irritabilitate, p. 24.

† Dissertat. de Naturâ Humanâ, p. 45.

‡ Dissertatio de Vivis Humani Corporis Solidis. In App. Exp. 10.

The following is an abstract of those experiments. In four he could not detect indications of irritability, although he applied various stimuli to the arteries*. In six instances the effect was not sufficiently evident for him to determine whether it should be attributed to the irritable property, or to some other cause†. His mind, therefore, remained doubtful for some time; but when, from other more decisive experiments‡, in which every caution to avoid error had been employed, the most satisfactory proofs of irritability appeared, he ceased to think the result of the six experiments at all doubtful. He adds that these experiments were witnessed by several friends; and in one instance the effect of the stimulus was so manifest, that the most sceptical must have been convinced of the existence of an irritable property in the arteries. We may judge how deeply he was impressed with a conviction of the action of the artery, from the strong metaphorical language he uses to express himself on that occasion. “Quasi
“ nunc demum penitus percipiens stimuli mo-
“ lestiam||.”

* Verschuir de Arteriarum et Venarum Vi Irritabili. Exp. 12, 15, 20, 21.

† See Experiments 2, 3, 4, 10, 11, 19.

‡ See Experiments 1, 5, 7, 8, 9, 13, 16, 17, 18, 19, 20.

|| As this Dissertation is little known, it may be no unacceptable addition to what has been said to subjoin the following conclusions of the writer referred to. “Varios

Verschuir's experiments, though now seldom adverted to, drew attention when they were published. Dr. Dennison, in his Inaugural Dissertation, has taken advantage of them, and supports his arguments for the irritability of the arteries by the facts brought forward by that

“ vidi in his experimentis eventus. In nonnullis nulla
 “ manifesta irritabilitatis et contractionis signa, licet variis
 “ stimulis arterias irritarem, detegere potui: in aliis res
 “ non adeò manifesta fuit ut dubius hærerem, nùm quidem
 “ ille effectus principio irritabili tribui deberet, an potius
 “ alii cuidam causæ: neque hæc mihi satisfecerunt, ut
 “ absque scrupulo calculum adfirmanti sententiæ adjicere
 “ auderem, cùm autem sæpius idem, omni adhibita cautela,
 “ viderem, cùm luculentiora iis irritabilitatis indicia obser-
 “ varem, majorem vim probandi arteriarum irritabilitatem
 “ adquisiverunt. Expertus enim sum ad irritationem, ope
 “ stimuli ferrei in arteriis contractiones quas non solum
 “ ego, sed et Amici et socii mecum viderunt. Gaudeo in
 “ primis hæc confirmari auctoritate cel. Van Doeveren,
 “ viri naturam consulere soliti, peritissimi, qui quidem his
 “ experimentis quandoque adesse voluit. Leviter radendo
 “ et comprimendo ope scalpelli et tenaculi, arteriam con-
 “ trahere vidi non unà, sed iteratis vicibus; manifestissimè
 “ semel, dùm attentus eram ad mutationem ex irritatione
 “ in arteria ortam, observavi hanc partem esse contrac-
 “ tiores, ac ante fuerat: momento cùm hunc effectum in-
 “ spexeram, in arteria eodem illo loco longè arctius ac
 “ adhuc fuerat (quasi nunc demùm penitus percipiens
 “ stimuli molestiam) ante oculos sese constrinxit, adeò
 “ clarè, adeò dilucidè, ut nullum dubium de irritabilitatis
 “ effectu restaret.” — *Verschuir de Arteriarum et Venarum
 Vi Irritabili.*

writer. In addition to those described by Verschuir, he relates four experiments made by himself, in two of which he detected irritability in the arteries*. But the labours of Mr. John Hunter, in whose accuracy we may place unlimited confidence, unequivocally tend to prove the irritable power of the blood vessels. No one can peruse his excellent work on inflammation, without feeling the force of the facts and reasoning by which he supports this view of the subject†. He states, among other experiments, that having laid bare the posterior tibial artery of a dog, he observed it to be so much contracted in a short time, as almost to prevent the blood from passing through it, and when it was divided the blood only oozed from the orifice. This fact is confirmed by Dr. Fowler, who in his thesis gives us experiments on the arteries in the ears of rabbits, in which very similar results ensued‡. But to quote all the testimony in favour of the irritable power of the arteries would be superfluous; it will be sufficient for the present purpose to mention such authorities as are in the greatest estimation. Even the works of Bichat, who is the decided opponent of those who have contended for the irritability of the arteries, contain facts which

* Dr. Dennison de Vasorum Irritabilitate.

† Hunter on the Blood, Inflammation, &c.

‡ Disputatio Inauguralis de Inflammatione.

favour this supposition. How are we otherwise to account for the manifest contraction of the arteries under chemical stimuli, observed by him? Will the cool and dispassionate judge be content with Bichat's feeble attempt to evade this conclusion, by declaring that it proceeded from the "racornissement" of the vessel? This racornissement, or corrugation, never takes place so as to lessen the caliber of the vessel in any great degree. This appears to be an attempt of a kind not very unfrequent in the works of that celebrated physiologist, to offer such an explanation of a fact as may support some favourite hypothesis.

Dr. Jones, in his excellent work on hæmorrhage, ably combats the hypothesis of elasticity being the sole agent in the contraction of the large arteries; and adduces instances in which exposure to the air produced so much contraction as to prevent the pulse being felt or seen, although when the artery was first exposed dilatation and contraction of the vessel had been very evident*.

In this place, some comments may be offered on

* *Insuper arteriæ aëri expositio necessaria, contractionem quandam creat, quæ stimulorum mechanicorum effectum haud parùm imminuet, si non omninò irritum reddet: nam certum est, et sæpè in experimentis in canibus institutis observavi, arterias etiàm magnas, quæ, quùm primùm aëri exponuntur, tam oculo quam manu pulsare manifestè observantur, brevi admodùm tempore interjecto, neque oculo, neque tactu moveri percipi posse, sive id ad ani-*

the late publication on the pulse by Dr. Parry, noticing those experiments which are by some supposed to demonstrate that the arteries are not irritable: for that learned author, from whom it is necessary again to quote, conceives that the facts he adduces shew “ that the vital power possessed by the arteries is so far different from that which in muscles is called irritability, that an artery suffers no degree of contraction from a great variety of chemical and mechanical agents, called stimuli; for none of these substances, applied to any part of an artery, will cause it to contract.” Hence, as was before observed, he is inclined to attribute a power of another kind to the arteries, which he calls tonicity. We quarrel not with the term, provided the experiments demonstrate any new faculty in the vessels, or invalidate the testimony of other writers on this point; but, in attending to the history of these cases, it will be found to speak a language quite plain and intelligible, and manifestly to support the opinion here advanced relative to the action of the arteries.

Dr. Parry does not seem to allow that he applied any stimulus to the vessels, during their exposure; nor, in his reasoning on his experiments, does he advert to the unnatural circumstances under which his observations were made; which

malis terrorem et dolorem, sive ad frigoris effectum, sive ad utramque causam, sit referendum. — *Jones de Arteriæ Sectæ Consecutionibus*, p. 29.

circumstances must, however, necessarily have influenced the result. Some of his experiments seem, indeed, to lead to a train of reasoning very different from that which he adopts; particularly the 13th, the 24th, the 26th, and the 27th. In the 13th, a contraction was produced by denuding the carotid artery; also, in the 24th, after the left carotid artery had been exposed for half an hour, it was found, by accurate measurement, to have diminished in caliber nearly one-third. The 26th is still more remarkable, for in that instance the carotid artery, when exposed, was $\frac{21}{100}$ of an inch in circumference, but it almost immediately shrunk through the whole space which was exposed, so as to become, in circumference, only $\frac{188}{1000}$ of an inch. At the same time, a portion of the artery which had been more recently exposed was $\frac{254}{1000}$ of an inch. The circumstance of the great diversity of diameter in contiguous portions of the same artery, as demonstrated in this case, according to the longer or shorter application of the air and other irritating substances, seems to prove that the degree of contraction in the fibres of different portions of the same vessel was in proportion to the intensity of the stimulus applied, and the time of its application. Nor was this a solitary example of the great variation of diameter in the arteries when exposed; for in the 27th experiment it is expressly stated, that that portion of the artery which had been exposed was found to be much less than the part above or below it.

The additional experiments lately published by Dr. Charles Henry Parry are still more conclusive. In the 4th experiment, it is observed, that “before
“any diminution of size had taken place from exposure or irritation, it was evident that no alteration dilatation or contraction of the artery existed. In ten minutes after exposure, there was
“an evident contraction of the artery.” In the 5th he says, “the left carotid was exposed. Immediately on exposure, the circumference of the
“artery was $\frac{350}{400}$ of an inch. In fifteen minutes the artery measured $\frac{365}{400}$ of an inch, having lost
“ $\frac{85}{400}$.” In the 7th experiment it is remarked, that “a saturated solution of common salt was
“then applied. In four minutes the circumference became $\frac{372}{400}$ of an inch. After washing
“off the salt, the liquor ammoniæ carbonatis was again applied, and in four minutes the artery
“measured $\frac{300}{400}$, suffering a loss of $\frac{72}{400}$ of an
“inch*.”

Let us inquire in what respect these results differ from those that would have taken place in a part which is acknowledged to possess the faculty of irritability, under like circumstances. If we open the abdomen in a living animal, and observe the intestines, are they not spasmodically contracted? and is not this attributed to the action of the unnatural stimulus on the muscular fibres of the intestines? and in what respect does this con-

* Additional Experiments on the Arteries, by C. H. Parry, M.D. F.R.S. p. 7, 10, 13.

traction differ from that observed by Dr. Parry in the cases above quoted? For the most strenuous supporter of tonicity cannot deny, that in separating an artery from its coverings, exposing it to the air, and measuring it with instruments, Dr. Parry necessarily subjected it to the action of stimuli. He must also admit, that those stimuli produced a shortening or contraction of the circular fibres of the middle coat; for in the 26th experiment, the circumference, in the first instance, was $\frac{21}{40}$ of an inch. Now Dr. Parry himself admits, in the 52d page of the treatise alluded to, that the shortening or contraction of a fibre, by the application of a stimulus, is the best evidence that can be given of its being irritable.

The irritability of the arteries seems therefore to be proved by the experiments of Dr. Parry and his son, who contend that they possess no such property.

On the whole then it appears, from the review of the opinions of various authors, that the testimony is decidedly favourable to the irritability of the larger arteries. At the same time it should be recollected, that in all disputed subjects we should not so far depend on the observations of those who have gone before us as to omit further inquiry. The author, therefore, will submit to the reader's judgment an account of some experiments which he has himself made, and the deductions to which, in his opinion, they lead. As many of them were

similar in their results, those which have a near resemblance shall be arranged under distinct classes; and one of the most satisfactory experiments of each class shall be fully related, so as to give a precise idea of its nature and effects. The remainder shall be exhibited in a short tabular form. This arrangement will comprehend four classes.

1. *Slight Contraction.* — By this the fact is expressed, that a part of the vessel, in length not more than the thickness of a thread, became much smaller than the part above or below, and remained in that state sometimes for a minute, sometimes for nearly half an hour.

EXPERIMENT.

The femoral artery of a cat was exposed, and scraped with a scalpel. During the first twenty minutes no visible effect was produced; but after that time, the contractions and dilatations were clearly perceptible, and in half an hour a slight permanent contraction occurred, which continued until the experiment was closed.

2. *Extensive lasting Contraction.* — In the instances of this kind, a portion of the vessel, from a quarter of an inch to two inches in length, became smaller than the parts of the vessel above or below, which contraction generally lasted from a minute to a quarter of an hour.

EXPERIMENT.

The femoral artery of a dog was exposed, and a ligature passed around it so as to embrace it closely without diminishing its diameter. The vessel was irritated with the point of a scalpel, and an increase of pulsation was several times produced. Whenever the irritation was omitted, the motion of the vessel returned to the state it was first in. In about a quarter of an hour after the commencement of the experiment, the pulsation ceased to be visible, and the vessel appeared contracted, the ligature having become lax. A second ligature was now drawn, as the first had been, closely around the artery. The two ligatures were then removed and measured. The length of the first ligature was 0·7 of an inch; that of the second, 0·6 of an inch.

3. *Irregularity of Surface in the exposed Artery.*—In this result, the vessel, which when first exposed had been smooth and even, became unequal, as if composed (like the trachea) of rings; which irregularity appeared to arise from the permanent contraction of the fibres of the middle coat.

EXPERIMENT.

The femoral artery of a cat was exposed, and irritated with the point of a scalpel. In about a quarter of an hour, the artery, which at first

had felt smooth and even to the finger, became uneven and annulated.

4. *Great Increase of Motion in the part of the Vessel irritated*, which immediately succeeded the application of the stimulus.—This increase of motion did not arise from any modification of the heart's action; for the degree of dilatation and contraction in the unirritated part of the vessel nearer the heart was unaltered.

EXPERIMENT.

The abdomen of a full grown rabbit was opened, and the aorta exposed. The pulse was perceptible, but not very distinctly so; neither could those present say, positively, that there was lateral dilatation. Liquor ammoniæ was applied to the artery: its motion was perceptibly increased by it; and a second application of the stimulus being made, alternate dilatation and contraction were rendered very evident. A thread was then passed tightly around the aorta, and the ammonia again applied. The vessel, during its dilatation, rose much more above the thread after the stimulus was applied than it had done before. Each application of the ammonia produced a similar effect.

TABLE I.

<i>Stimulus.</i>	<i>Animal.</i>	<i>Part irritated.</i>	<i>Effects produced.</i>
1 Attrition	A Rabbit..	Abdominal Aorta....	{ After irritation had been applied 3 minutes the vessel contracted.
2 Attrition	A Cat	Abdominal Aorta....	{ In 5 minutes dilatation and contraction increased; in 7 minutes the vessel permanently contracted.
3 Attrition	A Dog....	Mesenteric Arteries..	{ Pulsation at first increased; in 5 minutes permanent contraction.
4 Attrition	A Dog....	Femoral Artery	{ Pulsation at first increased by the stimulus; in 13 minutes permanent contraction.
5 Attrition	A Cat	Femoral Artery	{ In 10 minutes, $\frac{1}{2}$ an inch of the vessel permanently contracted.
6 Attrition	A Cat	Small Artery	{ When first exposed did not pulsate, after 10 minutes' irritation, pulsation very perceptible.
7 Attrition	A Cat	Femoral Artery	{ In $\frac{1}{4}$ of an hour the vessel became irregular from contiguous contractions.
8 Attrition	A Cat	Femoral Artery	{ In 5 minutes the vessel contracted; the contraction lasted 10 minutes, then gave way, and dilatation and contraction became very perceptible, the vessel being moved in a tortuous manner.
9 Attrition	A Dog....	Femoral Artery	{ In 5 minutes the vessel contracted; in 10 vermicular motion was produced.
10 Attrition	A Cat....	Femoral Artery	{ Increased pulsation in the part irritated, after each application of the scalpel.
11 Attrition	A Cat	Femoral Artery	{ In $\frac{1}{4}$ of an hour dilatation and contraction increased; in 20 minutes permanent contraction.
12 Attrition	A Cat	Femoral Artery	{ In 5 minutes pulsation rendered more perceptible.
13 Attrition	A Cat	Femoral Artery	{ In 15 minutes a ringlike appearance of the vessel; in 20 minutes tortuous movement.
14 Attrition	A Dog	Femoral Artery	{ Dilatation and contraction became more evident from the irritation.

INTRODUCTION.
TABLE I. (*Continued.*)

	<i>Stimulus.</i>	<i>Animal.</i>	<i>Part irritated.</i>	<i>Effects produced.</i>
15	Attrition	A Dog....	Femoral Artery	{ In 5 minutes a ringlike appearance came on, and in 10 minutes the vessel moved in a tortuous manner.
16	Attrition	A Dog....	Aorta	
17	Atmospheric Air.	A Cat	Mesenteric Arteries..	{ All these vessels, which on first opening the abdomen could not be seen to move, in 10 minutes became tortuous, and a vermicular motion was evident in them.
18	{ Atmospheric Air, & dissecting the Covering. }	A Dog....	Carotid Artery	
19	Ammonia	A Rabbit..	Abdominal Aorta....	{ Contractions and dilatations immediately much increased.
20	Ammonia	A Horse ..	The Carotid.....	
21	Ammonia	A Horse ..	The Carotid.....	{ There was, when exposed, no dilatation during the systole of the heart; but, after the application of ammonia, dilatation and contraction became very evident.
22	Ammonia	A Dog....	Femoral Artery	{ On first appearance no dilatation or contraction; the artery measured $\frac{54}{100}$ of an inch in circumference; ammonia was applied, and the pulsation became visible; after three applications the vessel in one part contracted, and above it dilated; the following were the measurements—dilated part $\frac{66}{100}$ of an inch, contracted part $\frac{52}{100}$ of an inch.
23	Ammonia	A Dog....	Aorta	{ Pulsations became increased, and part of the vessels to which ammonia was applied, dilated; proved by the measuring of ligatures drawn closely around the vessel. The ligature before the ammonia was applied measured $\frac{10}{100}$ of an inch, after application $\frac{18}{100}$ of an inch.
24	Nitric Acid	A Cat	Femoral Artery	{ Nearly a similar result.
25	Nitric Acid	A Dog	Aorta	{ Contraction immediately produced; in 10 hours again looked at the artery. Contraction had disappeared. Chemical effect of acid visible.
				{ Vessel contracted much. A ligature applied before application of nitrous acid, measured $\frac{35}{100}$ of an inch; a ligature applied after acid measured $\frac{35}{100}$ of an inch.

It now remains to be determined how far the results of these experiments tend to prove the irritability of the blood vessels. The coincidence of results with those of the writers above quoted, will best appear by comparing the effects produced under similar circumstances in these experiments and in those before alluded to. In instituting this comparison, the effects which arise from denuding the larger arteries may be first reviewed. On this point there is no diversity in the testimony of Hunter, Fowler, Jones, and the two Parrys. Each bears witness to a contraction frequently arising from the exposure of arteries; and in the author's experiments this was often seen to happen. In those examples in which the mechanical irritation with the scalpel was employed, we shall find abundant reason to acknowledge a uniformity of result. A contraction, which in some instances remained even after the apparent death of the animal, was a common effect of the stimulus in Verschuir's experiments. In the foregoing table many instances may be found in which this event ensued. An increase of dilatation and contraction in the exposed part of the vessel, whilst the stimulus was applied, is mentioned by Verschuir and Senac; and the experiments of the author prove this to be not an uncommon occurrence. Verschuir speaks of a knotty appearance sometimes taking place in arteries when scraped with the scalpel.

This seems not to differ from the irregularity of surface described as a result in the experiments of the author, and as arising from the contraction of the fibres of the middle coat.

Zimmerman, Dennison, and Bichat, all agree that acids produce contraction; and the 24th and 25th experiments in the table are a confirmation of their evidence.

These authors then coincide in stating that exposure of an artery to the air excites contraction; that irritation with the scalpel produces a contraction, or increases the pulsation, or brings on an irregularity of the vessel, which may be felt with the finger; and, finally, that the application of the stronger acids to an artery causes contraction.

It is to be regretted that the effects which arose from the application of ammonia in the author's experiments do not correspond with those which Bichat has detailed, who denies the possibility of producing any contraction in arteries by means of alkalies. It is painful to oppose one whose experimental accuracy is so generally admitted; but the results of the author's experiments are given as they occurred, and as they impressed those friends who assisted him in making them. In one experiment, an artery was proved by admeasurement to be one-eighth less in circumference after the application of the ammonia than it had been before. In other examples the ammonia pro-

duced an opposite effect. From the violence of the stimulus the irritability of the artery was suddenly diminished, and a dilatation of the vessel ensued. In other examples it very much increased the action of the vessels; for arteries, which when first exposed scarcely pulsated, were very evidently contracted and dilated immediately after being touched by the liquor ammoniæ*.

The facts already adduced most unequivocally demonstrate the arterial tubes to possess a high degree of vital contractility. But their active

* Neither Dr. Parry, nor Dr. C. H. Parry, has been able to detect alternate dilatation and contraction in the arteries when exposed. Since the appearance of Dr. Parry's publication, the author has, in numerous instances, attended to this circumstance; and the result of his observations is, that dilatation and contraction may frequently be seen. It is true that the artery, when exposed, is often quiescent; which appears to arise from some contraction of the vessel preventing the blood which is propelled by the heart from dilating it. Certain it is, however, that the author has frequently seen the arteries contract and dilate when exposed, and principally during the application of chemical or mechanical stimuli to them. He would feel almost afraid to maintain this controverted point on his single testimony, and is therefore happy to say that it is supported by that of several friends, who witnessed the experiments, and were satisfied that in many instances they saw alternate dilatation and contraction of the larger arteries. He begs here to return his best thanks to Drs. Brayne, Archer, Hawkins, and Osborne, who kindly assisted him in the above experiments.

agency is not only supported by such experiments as those related; it is also countenanced by an extensive series of phenomena presented during disease in the human subject. Of these may be mentioned irregular determinations of blood, the growth of tumors, increased pulsation of arteries leading to inflamed parts, of which the following is a well marked example, the accuracy of which may be entirely relied upon. The carotids, when the person alluded to is in health, beat equally as to strength and frequency; but when he is attacked with inflammation in the right tonsil, to which he is particularly subject, and which sometimes proceeds so far as nearly to prevent deglutition, each pulsation of the artery gives a throbbing sensation on the right side of the head. On the application of the hand at this time to each carotid, the right is found to beat much stronger and fuller than the left.

This diversity of action in these two arteries cannot arise from any impulse given to the blood by the heart: it must be derived from some modification of the contractile power of the artery. It is true that Dr. C. H. Parry wishes to attribute to the remote influence of the heart some of the phenomena of local congestion and motion; and to shew that the different states of vascular dilatation are still more conspicuously connected with the different degrees of action in the heart, and the consequent momentum of blood,

than with local circumstances; and that the proneness to local dilatation, or, as it is called, action, is a consequence of slowly succeeding but continued impulse*.

But it seems impossible to grant such extraordinary powers to the heart; and, until the writer alluded to can bring forward more evidence in support of his opinions, few probably will coincide with him. If, however, he still retain the very improbable supposition that the influence of the heart produces some of the phenomena of local congestion and motion, he surely will never be bold enough to assert, that the difference in pulsation of the two carotids, in the instance alluded to, arose from the increased action of the heart.

The inference from all these facts seems to be, that there is sufficient evidence of the irritable power of the larger arteries. It has been shown that these vessels are obedient to chemical and mechanical stimuli, and that the effects arising from the application of these stimuli resemble those which they produce when applied to parts decidedly muscular; and, therefore, it follows, that the larger arteries exhibit those vital phenomena which characterize irritability in muscular parts.

Plainly as this inference seems deducible from

* Additional Experiments on the Arteries, by C. H. Parry, M.D. F.R.S. Preface, p. 6; and in the work, p. 112, 114.

the preceding statement, yet on this, as on almost every point in medicine, we are doomed to meet with conflicting opinions. Certain prepossessions, the apparent, though not real opposition of some facts, and an incautious mode of reasoning, have all had their share in obscuring the truth, and have given birth to objections. These, for the most part, have not much weight. There is one, however, which at first sight may impose on some minds: it is denied that there are any indications of irritability from the application of some stimuli. Bichat and Majendie both declare that they have only seen contraction from acid stimuli, which contraction they explain on chemical principles. This want of coincidence with the other writers on the subject is much to be regretted; but still, if we are to put any confidence in those who have described at length their experiments, we must arrive at an opposite conclusion, and rely more on their affirmative than on Bichat and Majendie's negative experiments. Besides, neither Bichat nor Majendie gives a detailed account of his experiments, which, if fully narrated, might, as well as Dr. Parry's, have been found to afford evidence against their own opinions. It should also be kept in view, that, in some instances, the stimulus may be applied a considerable time before any effect is produced. In two experiments made by the author, it was near an hour before any

contraction took place in the artery. What also greatly lessens this objection, is the fact of our not always being able to excite contraction in those parts which are allowed to be irritable. Verschuir relates instances* in which he applied electricity to the heart and bladder without any contraction arising from it; and Zimmerman† says he could not always excite by stimuli parts undoubtedly muscular. This shows us how cautious we should be in drawing inferences from those cases in which arteries are not immediately affected by stimuli.

Another objection has been made relating to the stimulants employed. It has been said by some writers, particularly by Bichat, that the effect of any acid stimulus is independent of the vital power; and he supports this opinion by saying, that alkalies produce no effect on the action of arteries. He has not however given any history of these experiments with alkalies. Results obtained by Dr. C. H. Parry, and by the author, which lead to a directly opposite conclusion, have been before noticed. But whatever weight be allowed to this objection, it will not apply to the examples brought forward in this essay, as in many instances the contraction arose from mechanical stimuli, or ammonia. Again, it appears that the

* Verschuir de Arteriarum et Venarum Vi Irritabili, Exp. 22.

† Zimmerman de Irritabilitate.

objections adduced against acids is by no means well founded. In the cases in which the nitric acid was used the contraction of the vessel disappeared in a few hours; but the chemical effect on it, and the parts around, continued some time afterwards*. Besides, from several experiments that will be related in the sequel, it will appear that no visible contraction arises in the vessels of dead animals from the acids, although they become white from their chemical action. From all these circumstances it is quite manifest that the chemical action and vital contraction are separate effects produced by the acid, which may, by an experienced eye, be readily distinguished. This may serve to show the inexpediency of urging the uncertainty of acid stimuli as an objection.

A recent writer seems to object to these vessels being considered irritable, although they obey chemical and mechanical stimuli; because he denies the efficacy of contraction and dilatation in producing the state of undisturbed circulation under the ordinary circumstances of life; or does not admit that the blood is a stimulus corresponding with those causes of chemical or mechanical irritation†. The question then, in the work of Dr. C. H. Parry, assumes a new shape. The

* See Table, Experiment 24.

† See Additional Experiments on the Arteries by Dr. C. H. Parry, p. 99, 124.

father, in the experimental inquiry into the nature of the arterial pulse, maintains that the arteries are not irritable, because they are not affected by a great variety of chemical or mechanical agents called stimuli. The son, in his additional experiments, says, " We may be disposed to admit the
" possible production of such an effect, (contrac-
" tion from chemical or mechanical stimuli) but
" does this admission prove the blood to be a
" stimulus corresponding in its properties with those
" causes of chemical or mechanical irritation*?"
Again: " You may (by irritation) dilate perma-
" nently, or permanently contract the caliber; in
" either of which cases the phenomena of inflam-
" mation might occur; but these effects warrant
" no conclusions as to the powers by which the
" healthy conditions are maintained †."

This argument does not at all affect the point now in discussion; for if, as even Dr. Parry senior acknowledges, all parts are irritable which contract on the application of stimuli, Dr. Parry junior, when he admits that the arteries are affected by chemical and mechanical agents, can no longer, consistently with his father's views, deny that the arteries possess an irritable power; since tonicity, according to the definition of the term, is a mean state of contraction. Having once allowed that the arterial fibres are constituted so

* Additional Experiments, p. 124.

† Page 126.

as to obey chemical and mechanical stimuli when applied to them, it would be arguing against all analogy to maintain that they are not affected by the blood that passes through the vessels; because no one will deny that the blood is both a chemical and mechanical stimulus, which is much more nearly applied to the fibres of the middle coat than any of the stimuli ever are, that are used in experiments on living animals; and in all other parts which are endowed with irritability, this property is subservient to some specific purpose. The irritable fibres of the heart are acted on by the blood. Those of the stomach and intestines obey their peculiar stimuli, as do also those of the urinary bladder. Why then should Dr. Charles Parry, who experimentally shows that the arteries possess the same irritability, deny that their fibres are affected by that stimulus which seems proper to them? or why should he suppose that Nature endowed them with this property, not to assist in preserving the undisturbed circulation in the ordinary circumstances of life, but to enable them to contract or shorten their fibres when any foreign stimulus is applied to them?

It should be distinctly understood, that it is by no means necessary for those who conceive that the arteries possess an irritable power, to point out the mode in which their action influences the motion of the blood. A considerable degree of obscurity, indeed, still hangs over this subject,

which it is very desirable to have cleared up; but it is sufficient for their purpose to demonstrate that the arteries possess that property in no small degree; and the conclusion follows, that it serves some office in the circulation. Now surely this has been demonstrated; for it has been shown that an artery, on exposure to the air, will occasionally contract so powerfully as to become impervious; thus, actually exerting a degree of contractile power exceeding the momentum with which the blood is propelled into it from the heart. It has also been evinced, that one effect arising from the application of chemical and mechanical stimuli is greatly to increase the pulsations of the artery, in which event contraction and dilatation become very perceptible. Again, Dr. Charles Parry himself admits that “when a ligation is placed on an artery, or any other interruption to the circulation takes place, the blood moves in a retrograde current*.” Assuredly, by this admission, he attributes to the arteries a much greater power than that of tonicity; for by it he acknowledges that the force with which an artery contracts is such as entirely to overpower the action of the heart, and thus direct the blood in a current opposed to that in which it is propelled by that organ. The writer above mentioned endeavours to evade this obvious inference by a

* See Additional Experiments, p. 108.

species of reasoning which does not appear at all admissible. "These cases," he observes, "however, like many others, if indeed they prove any thing with regard to this function, prove that the circulation is independent of the heart." This conclusion seems by no means logically accurate; for the author of the additional experiments undoubtedly does not wish to assert that the circulation of the blood throughout the system, and the irregular motion produced in it by one vessel, are one and the same thing; and unless he does so, how can the experiment alluded to "prove that the circulation is independent of the heart?"

Will, then, the calm and unbiassed inquirer believe that, under circumstances such as have been stated, an artery exerts extraordinary contractile powers, and yet that in other circumstances "the vessel itself cannot be considered otherwise than as a comparatively passive tube*." Will he not rather grant that, in ordinary states of the circulation, the arteries assist the heart, and promote the course of the blood?

To pursue the objections.—It has been argued by Dr. Parry, "that any alternate contractile power, like that of muscular fibres in the arterial system, beyond that which implies a mere state of accommodation to the column of blood actually impelled into any part of it by the vis

* Additional Experiments on the Arteries, p. 113.

“ a tergo, would just as much tend to impede the
“ ingress of a new quantity of blood, as to pro-
“ mote the egress of that already existing in it;
“ and therefore could in no degree assist the cir-
“ culation*.” But this opinion is grounded on a
supposition that the ventricle, when it acts, has
to overcome the contraction of the arteries,
which is not at all warranted by facts; for there is
much reason to believe, that the middle coat of
the arteries is so constituted, that its fibres con-
tract and relax in such a manner as to assist the
heart, and promote the course of the blood. It
would therefore be almost as consistent with
sound logic to contend that the contractile power
of the ventricle is an obstacle to the flow of blood
from the auricle, as that the same power in the
arteries is an impediment to the blood which is
propelled into them from the ventricle.

II. Having noticed the objections that may be
made to the obvious inference that presents itself,
from a review of the evidence adduced in favour
of the irritability of the arteries, the phenomena
which may be observed in the capillary vessels
shall now be described. These seem to demon-
strate that the smaller vessels possess an equal, if
not greater degree of contractile power than the
larger arteries.

* Elements of Pathology and Therapeutics, p. 20.

Haller, who allowed, as has been before noticed, some degree of irritability in the larger arteries, altogether denied the existence of any such property in the smaller vessels. It appeared to him quite inconsistent to call these vessels irritable, since he had never seen them contract*. But this objection by no means satisfied Professor Whytt. It did not escape his penetrating mind, that although no pulsation could be detected in these vessels, yet a variety of facts clearly proved their vital action. Local stimuli cause local inflammation: shame produces blushing. He also adduces the striking circumstance of the flow of saliva in hungry persons, the flow of tears by acrid applications to the eyes, the irregular oscillatory motion of the blood in the smaller vessels, none of which effects, he conceives, can arise from the action of the heart; but they receive a ready explanation by admitting the existence of a vital contractility in the smaller vessels†. John Hunter, in his work on inflammation, relates several experiments on the arteries of dead animals, which seem to him satisfactorily to prove that the small vessels are

* Sed delentur etiam omnia, quæ à vi irritabili et oscillatione vasorum minimorum clari viri expectarunt. Si enim arteriæ minores non contrahuntur, sequitur neque irritabiles esse, neque sanguinis iter promovere. — *Halleri Elementa Physiologix*, tom. ii. p. 212.

† Whytt on the Motion of the Fluids in the small Vessels.

more muscular than the larger arteries*. Bichat's opinions concerning the capillary vessels differ from all those who preceded him. He attempts to demonstrate that the impulse given to the blood by the heart does not extend to the capillaries, and consequently attributes its motion in those minute tubes to a vital power of contraction proper to them. This faculty he calls insensible organic contractility, or tonicity; which term, as has been already observed, he uses to designate a low degree of irritability†. But none of the writers hitherto mentioned were enabled to discover an increased action from the application of stimuli. It was reserved for Dr. Wilson Philip, by experiment, to correct the error into which Haller led his followers, by denying the contractility of the minute vessels. In the introduction to his treatise on febrile diseases, he relates several instances in which the application of spirit of wine to the web of the frog's foot increased the velocity of the circulation in that part‡. Dr. Thomson has also brought forward several examples, in which a contraction was caused by the application of ammonia to the capillary vessels of the same animal||.

* Hunter on the Blood, Inflammation, &c.

† Dans le système capillaire générale la contractilité organique insensible, ou la tonicité, reste seul pour cause de mouvement du sang.—*Bichat Anatomie Générale*.

‡ Wilson Philip on Febrile Diseases.

|| Thomson on Inflammation, p. 83.

These experiments receive further confirmation by the facts lately detailed by the former writer in his treatise on the vital functions. He there confirms the observation made by Haller and Bichat, that the circulation in the smaller vessels continues for some time after the heart is removed. But what is still more satisfactory, he seems, by the 29th and 30th experiments, to have proved that the capillaries obey stimuli applied to the brain and spinal marrow.

Nothing can be more satisfactory in evincing the existence of an irritable property in the capillaries than the authorities which have been adduced; yet, notwithstanding all this weight of evidence, many writers of the present day will not admit any such vital faculty in these vessels; and in their pathological inquiries overlook the diseased action of the capillaries, which often forms an important link in the chain of morbid phenomena. Therefore the following observations, made on the smaller vessels to ascertain their contractile powers, may be here detailed.

In the transparent parts of animals we have, by aid of the microscope, a very good view of the circulation, and are enabled to trace the ramifications of the arteries till they become small capillary tubes; and these again, till they gradually enlarge into venous trunks. It requires much practice, however, in the use of the microscope before any dependence can be placed on

the experiments of the most careful observer. It is the more necessary to insist on caution in drawing conclusions from this kind of experiment, because so many causes may disarrange the natural order of the circulation; and thus a casual occurrence may be mistaken for the usual course of the phenomena. Alive to the numberless obstacles which might oppose this investigation, the author has never considered any new appearance as entitled to be relied upon, until repeated examinations had narrowed, as far as possible, the field of error.

These experiments were principally made on the web of the frog's feet, because the animal suffers little from being enclosed in a linen bag, and having its foot fastened in the field of the microscope, by which a good view of the vessels is obtained. Before commencing the experiments, it was necessary to become familiar with the circulation in the web, which in ordinary circumstances is effected as follows:—Large arterial and venous trunks run along the toes. On the web itself the arteries ramify in a beautiful manner, and communicate with each other by frequent anastomoses. They generally divide into myriads of minute vessels, which are seen in every part of this delicate membrane. These capillary tubes may at length be observed gradually to enlarge; and ere long small venous trunks appear; these are for the most part larger than the arteries, twice

as numerous, and they more freely communicate with each other, and with the capillaries; which latter vessels might not improperly be called a venous net-work. The arteries, however, do not invariably divide into very minute tubes: it occasionally happens that a large arterial trunk communicates directly with the venous vessel, and pours its blood into it.

With regard to the appearance of the blood in the vessels, it may be remarked that small globules float in a serous fluid. These globules approach much nearer to each other in the arteries and veins than in the capillaries. The most minute of these last vessels admit only one globule at the same time; and a considerable space intervenes between them, in which space serous fluid is alone observable. The globules are not moved on their axis, nor do they appear to change their figure whilst passing through the innumerable circumvolutions and windings of the vessels. It is difficult to give a precise idea of the colour of the blood, because it is much altered by the degree of the intensity of the light; but the blood in the veins, which nearly accords with Werner's tile red, is the darkest; that in the arteries ranks next in deepness of colour; and last of all the capillaries, in which, when the light is very bright, the globules appear almost pellucid. From frequent observations on these three orders of vessels, it was found, when the leg was so placed as to allow every part of the

animal to be free from pressure, and the action of the heart undisturbed, that the blood moved with considerable rapidity, and in an uninterrupted stream. Indeed this mode of observation is so convenient, and productive of so little pain to the frogs, that for an hour together the globules may be seen flowing with rapidity through a series of convoluted vessels, without manifesting any sensible impulse during the contraction of the ventricle; the blood always moving faster in the arteries than in the veins, and faster in the veins than in the capillaries.

Those phenomena which present themselves when the natural order of the circulation is disturbed, shall next be described. The means which were employed to interrupt the ordinary motion of the blood, were,

1. By the external pressure of the limb.
2. By ligature applied to the small vessels.
3. By ligature placed on the great vessels, or excision of the heart.
4. By the application of stimuli to the minute vessels.

1. *External Pressure of the Limb.*

EXPERIMENT.

A frog's foot was brought into the field of a microscope, and the circulation observed for some time. The blood was moving in an unin-

interrupted current through the numberless vessels in the web. A ligature was thrown round the limb. The motion of the blood became much slower; and a sensible impulse was given to it in the three orders of vessels at each contraction of the ventricle. In several other instances a similar result ensued.

EXPERIMENT.

Considerable pressure was applied to the limb of a frog, the circulation having been previously observed to be in a natural state. The effect of the pressure was to cause the blood to move slower; and in one large vein, an oscillation, that is, a moving backwards and forwards of the blood, took place for some minutes. The oscillation of the blood in the vessels of the web was seen in numberless other instances.

EXPERIMENT.

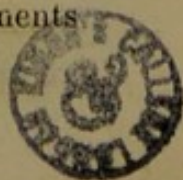
The circulation was observed to be perfectly natural. A ligature was then drawn very tightly on the limb of a frog. In one artery the blood took a retrograde direction, and flowed in a brisk current towards the large trunks. At the same time, in one large vein, and in the minute ramifications into which it divided, the blood took an opposite current to that in which it had been before moved, flowing, in a quick uninterrupted stream, from the trunk towards the branches; so that the

vein and its ramifications resembled arterial tubes. This phenomenon continued for five minutes, when the pressure was removed, and the blood resumed its accustomed current. These appearances were verified in several other examples.

The conclusions to be drawn from these experiments appear interesting. From the first we learn, contrary to what has been maintained by Bichat and some other physiologists, that the action of the heart influences the circulation in the capillaries, and that it even extends to the veins*. For in what other way can we account for the sensible impulse given to the venous blood at each systole of the ventricle, but by supposing that the impetus given to the mass of blood was felt in these tubes?

The results of the two last experiments particularly deserve the reader's attention. They prove that the contractile power of the minute vessels is capable of producing irregular motion in the blood without any assistance from the heart. In one of them, a ligature being drawn very tight round the limb, the blood flowed very briskly, in a direction opposed to that it would have taken if put in motion by the contraction of the ventricle, and in the other the

* See Thomson on Inflammation, in whose experiments similar results occurred.



blood moved to and fro in the vessels without making any progression*.

2. This power of the small vessels to produce motion in the blood independent of the heart, appears also from the effect of obstruction to the flow of blood through them, as demonstrated by the following experiment:—

EXPERIMENT.

The motion of the blood was observed for a considerable time in a large vein of a frog's foot, which emptied its contents into a still larger vessel running along the middle toe. The blood in it flowed with considerable celerity and in an uninterrupted stream, from the branches towards the trunk. The vein was transfixed with a needle, which prevented the blood passing on in the accustomed current. No accumulation of blood took place; it immediately took an opposite direction, and flowed with as much celerity towards the veins of the opposite toe as it had previously done in the contrary direction. This experiment was repeated several times, and was witnessed by several persons.

* See Dr. Philip's Essay on the Vital Functions, and Dr. Thomson on Inflammation, in which works similar results are recorded.

3. But of all the facts which prove a contractile power in the small vessels, none are more satisfactory than those which show that the circulation continues after the heart is removed. In several instances the author has known the blood move for a quarter of an hour after the removal of the heart*. But the circulation in this case is often as irregular as when pressure is applied to the limb or body before the heart is taken away. The blood oscillates in the arteries, and in the veins takes a retrograde current. The oscillation of the blood in the arteries and its retrogression in the veins, in such instances, is a strong argument against the hypothesis of Dr. Parry; who, in his work on the pulse, supposes that the motion of the blood after the removal of the heart receives a ready explanation from the gradual contraction of the larger arteries.

4. The effects produced by the application of stimuli to the minute vessels may now be stated.

EXPERIMENT.

The circulation in the web of a frog's foot was observed, and found natural. There was an artery running across the web from the middle toe, and

* Dr. Philip saw the circulation continue with regularity in the mesentery of a rabbit for half an hour after the excision of the heart.—*Essay on the Vital Functions*, 2d Edit.

dividing into capillaries. This vessel was touched with liquor ammoniæ. The blood in the capillaries in which it terminated soon moved slower. In two minutes the artery was contracted, and the motion of the blood through the contracted part was quickened at each systole of the ventricle, whilst the capillaries were somewhat dilated. In about four minutes the blood in the artery moved slower, and the contraction was increased—indeed so much increased, that this vessel was scarcely larger than the capillaries had been in the beginning of the experiment. In seven minutes the artery and its ramifications continued as before, whilst in all other parts of the web the circulation was natural. In eight minutes the artery became nearly of its former size, and the motion of the blood as it had been before the contraction of the vessel, with the exception that it was occasionally quickened by the contraction of the ventricle. The dilatation of the capillaries continued.

EXPERIMENT.

The web of a frog's foot was brought into the field of the microscope, and the blood observed flowing through the vessels in an uninterrupted stream. There was one large vein running across the web, and to this vessel oleum terebinthinæ was applied. In about ten minutes from the first application of the stimulus, the vein began to con-

tract; in twenty minutes, its size in one point was very much diminished; and beyond the contracted part, an evident impulse was given to the blood at each systole of the ventricle; although, at the same time, it moved on in an uninterrupted stream in the vessels of every other part of the web. In thirty minutes, the contraction had so much increased that the vein at that part was impervious.

No accumulation, however, of the blood happened; for as soon as the diminution of the main trunk was such as wholly to prevent its passage, it took a retrograde course in one of the larger branches, and thus the fluid was diverted from its wonted channel, and was distributed to the large veins on the opposite side of the web. The circulation continued in this direction for five minutes, at which period a small quantity of blood passed through the narrowed part at each contraction of the ventricle. This irregular propulsion of the blood continued but a short time; for suddenly the contraction vanished, and then the circulation in the vein and its branches returned to the state it had been in before the oil of turpentine was applied. It was not noted in what manner the capillaries were affected in this experiment.

EXPERIMENT.

A frog's web being brought into the field of the microscope, the circulation was observed to be natural.

Spirit of wine was spread over all that part of the web which was contained between the two outer toes, and the part of the web between the inner toes was untouched. In one minute after the application, the velocity of the blood's motion in that part of the web to which the spirit was applied increased, whilst the circulation in the part of the web which was untouched remained as at first.

EXPERIMENT.

After having observed the circulation in the web of a frog's foot, liquor ammoniæ was spread over the whole of it. In five minutes all the vessels were dilated, the blood became deeper coloured, and moved very slowly.

EXPERIMENT.

The circulation was first noticed, as before. A saturated solution of muriate of soda was spread over the whole web of the foot. In three minutes the arteries, veins, and capillaries became much dilated, the blood deeper coloured, and the globules scarcely visible. The blood moved slowly, and the web was rendered somewhat opaque. In five minutes the web was washed with spirit of wine. In two minutes afterwards, all the vessels were sensibly diminished in size, and the blood moved faster. At the end of a quarter of an hour,

the vessels had contracted to their former size, and the circulation became in every respect as when first observed.

EXPERIMENT.

The circulation in the web of a frog's foot being first attended to, and the foot then immersed in water, heated to 115 degrees of Fahrenheit's scale, for half a minute, the motion of the blood was immediately quickened, and the vessels in some degree contracted. The immersion was repeated with the same effect. After the foot had been immersed five times in water of the temperature as above, the vessels were much dilated, the blood became redder, moved slowly, and no globules could be seen; but it appeared converted into a red mass. After the vessels had continued in this state for twenty-five minutes, ice was applied to the web. The vessels in about a quarter of an hour again contracted, the globules re-appeared, and the natural motion of the blood was restored.

EXPERIMENT.

Ice being applied to the web of a frog's foot, in five minutes the motion of the blood increased, and the vessels contracted; but at the end of half an hour, during which time the ice was kept to the web, the vessels were dilated, the blood became redder, and circulated more slowly. Oleum tere-

binthinæ was now spread plentifully over the web. In ten minutes some of the vessels evidently contracted from the contact of the oil, and in them the motion of the blood acquired its former velocity. Many vessels, however, did not contract, but remained dilated with blood, which scarcely moved.

In the foregoing account of the effects of stimuli applied to the minute vessels, a particular description of the most important experiments has been given, in order that the circumstances under which they were made may be clearly understood. The leading circumstances of the remainder are given in the annexed Table.

TABLE II.

<i>Stimulus.</i>	<i>Part to which it was applied.</i>	<i>Effects produced.</i>
Liquor Ammoniaë	Artery of the Web . .	{ In 2 minutes a contraction was produced, which lasted 7 minutes.
Liquor Ammoniaë	A Vein of the Web . .	{ In 4 minutes contraction came on, and lasted 2 minutes.
Liquor Ammoniaë	A Vein of the Web . .	No contraction.
Liquor Ammoniaë	A Vein of the Web . .	No contraction.
Liquor Ammoniaë	A Vein of the Web . .	Slight contraction came on.
Liquor Ammoniaë	A Vein of the Web . .	No contraction.
Liquor Ammoniaë	A Vein of the Web . .	No contraction.
Liquor Ammoniaë	A Vein of the Web . .	An evident contraction was produced.
Liquor Ammoniaë	A Vein of the Web . .	{ So great contraction that globules scarcely passed.
Liquor Ammoniaë	A Vein of the Web . .	{ Considerable contraction produced in 2 minutes.
Liquor Ammoniaë	A Vein of the Web . .	In 6 minutes contraction produced.
Liquor Ammoniaë	Over the whole Web	{ In 5 minutes arteries, veins, and capillaries were much dilated.
Liquor Ammoniaë	Over the whole Web	The same result.
Liquor Ammoniaë	Over the whole Web	Nearly a similar result.
Liquor Ammoniaë	Over the whole Web	{ The vessels in general much dilated, one vein contracted.
Oleum Terebinthinaë . .	To an Artery	{ In 25 minutes the artery for some extent was much contracted.
Alcohol	To the whole Web . .	The motion of the blood quickened.
Alcohol	To the whole Web . .	The same result.
Prussias Potassæ	To a Vein	No effect produced.
Prussias Potassæ	To a Vein	No apparent effect.
Prussias Potassæ	To a Vein	Slight contraction.
Oxide of Arsenic	To an Artery	No contraction excited.
Oxide of Arsenic	To a Vein	No contraction excited.
Opium	To an Artery	Did not produce any effect.

TABLE II. (*Continued.*)

	<i>Stimulus.</i>	<i>Part to which it was applied.</i>	<i>Effects produced.</i>
25	Tinctura Lyttæ	To an Artery	In half an hour some contraction came on.
26	Tinctura Lyttæ	To a Vein	No contraction.
27	Tinctura Lyttæ	To a Vein	In half an hour slight contraction.
28	{ Acetic Acid with equal parts of water }	To an Artery	{ In a minute the vessel was considerably contracted.
29	{ Acetic Acid, with equal parts of water }	To a Vein	{ The vessel contracted so much that the blood flowed in a retrograde direction.
30	{ Acetic Acid, with equal parts of water }	To an Artery	Contraction produced.
31	{ Acetic Acid, with equal parts of water }	To a Vein	The same result.
32	{ Saturated Solution of Muriate of Mercury }	To a Vein	Two hours' application produced no effect.
33	{ Saturated Solution of Muriate of Ammonia }	To an Artery	In 5 minutes a contraction came on.
34	{ Saturated Solution of Muriate of Ammonia }	To a Vein	{ Contraction excited, and the blood moved in jets.
35	{ Saturated Solution of Muriate of Ammonia }	To a Vein	{ Dilatation of the vessel and the capillaries connected with it came on; in 2 minutes, by the application of spirit of wine, the vessels contracted.
36	{ Saturated Solution of Muriate of Ammonia }	To the whole Web ..	All the vessels became dilated.
37	{ Saturated Solution of Muriate of Ammonia }	To an Artery	A contraction caused.
38	{ Saturated Solution of Muriate of Ammonia }	To the whole Web ..	{ General dilatation of the vessels; and which spirit of wine was spread on the web, and soon after the vessels contracted.
39	{ Saturated Solution of Muriate of Ammonia }	To the whole Web ..	{ All the vessels soon dilated, the web came opaque; at this period alcohol being applied, the vessels were caused to contract.
40	{ Saturated Solution of Muriate of Ammonia }	The whole Web	{ Dilatation of all the vessels; in a few minutes, spirit of wine being applied, the vessels again contracted.
41	{ Saturated Solution of Muriate of Ammonia }	The whole Web	{ The solution produced general dilatation of the vessels; ice was then applied and speedily the vessels became contracted.
42	Nitrous Acid	A Vein	{ The web was so discoloured that the effect on the vessel could not be seen.
43	Tinctura Opîi	The whole Web	Circulation of the blood quickened.

It now only remains to point out the conclusions concerning the vital contractility of these vessels which the facts stated obviously lead to.

It appears that the application of a stimulus often quickens the circulation in the small vessels, whilst the motion of the blood in a neighbouring part, to which no stimulus is applied, remains unaffected.

That when a small vein or artery is touched by a stimulating substance, a contraction is often produced, so as to be visible by the help of the microscope. This contraction sometimes proceeds to such an extent as to prevent the free passage of the blood; and in this case it does not accumulate, but takes a retrograde course. During such contraction, if not sufficient to prevent the transit of blood, the impulse of the ventricle is generally perceptible in all the vessels in communication with the contracted one, and the blood in the capillaries connected with the contracted vessel for the most part moves slower.

That a stimulus, in the first instance, often produces a quickened motion of the blood and contraction of the vessels; but after it has been applied some time, dilatation of the vessels and a slower movement of the blood follow: but after the vessels are dilated by the action of one stimulus, some other stimulus will often produce contraction.

That the action of water, heated considerably above the temperature of the animal to which it

is applied, often occasions contraction of the vessels and acceleration of the blood's motion ; but after a certain time, dilatation and retarded circulation ensue. Ice generally produces a contraction of these dilated vessels, and restores the velocity of the circulation.

That ice kept in contact with the web of a frog's foot produces, in the first instance, a contraction of the capillaries, and increases the motion of the blood ; but after a certain period, if the application be continued, the vessels become dilated, and the blood moves slowly. A temperature of eighty degrees of Fahrenheit, however, or the application of *oleum terebinthinæ*, again excites the capillaries to contract, and the circulation is restored to its natural state.

When the foregoing facts, and the necessary conclusions to which they lead, are maturely considered, it will be admitted that the capillaries possess a very considerable degree of irritability.

III. Therefore, those appearances may now be noticed which favour the supposition that the veins are not devoid of an active contractility. In the experiments which have been already fully detailed, several are related in which, by the microscope, the contraction of small veins was rendered evident. Inquiries are now to be extended to veins of a much larger size.

Haller and many other physiologists have con-

fined the irritability of veins to those trunks that are near the heart, on which muscular fibres are very plainly developed. Verschuir, however, could not conceive it was at all probable that the irritable power was confined to the venæ cavæ and the four pulmonary veins*. From his experiments he concluded that there is a contractile power in the whole venous system; although he believed the veins possess this property in a less degree than the arteries.

In corroboration of these experiments, the following, which were made by the author, may be related:—

EXPERIMENT.

The thorax of a cat being opened, no pulsation of the pulmonary veins was observed; but nitrous acid being applied to one trunk, it and all its branches were much contracted.

* Minimè vero probabile est principium irritabile esse datum solis venis cavis, et pulmonalibus, cùm et in variis illius ramis contractionis indicia detecta sunt; hanc rem in venæ cavæ propaginibus jam observavit in gallinis Lancisius doctissimus: quoque M. Van Geuns in venâ jugulari manifestam contractionem, propellentem sanguinem ad cordis sinum, expertus fuit, quod et ego manifestè confirmatum vidi; nec reliquas etiàm venas ad stimuli applicationem semper inertes inveni, adeò ut illis omninò non propriam vim contrahendi ad stimulum negare audeam, licet credam ipsi illud minori gradu quam arteriis inesse. — *Verschuir De Arteriarum et Venarum Vi Irritabili.*

EXPERIMENT.

Nitrous acid was applied to the abdominal cava of a cat. Immediately the vessel was violently contracted. The thorax being afterwards opened, the acid was put on the vena cava near the heart, which produced a slight contraction.

EXPERIMENT.

The abdomen of a dog being opened, and the cava touched with acid, no contraction ensued; but the external jugular vein and a mesenteric vein evidently contracted from the application of the same stimulus: but the thoracic cava being exposed, and touched with the acid, no contraction occurred.

EXPERIMENT.

One of the large veins in a rabbit's ear was bared, and the acid applied. The vessel, in consequence, became so contracted that the blood could scarcely pass.

EXPERIMENT.

A vein in a rabbit's ear was exposed, and irritated with a scalpel, but no contraction ensued: and though, in several other instances, this mode of irritation produced no effect on the vessel, yet, in ten instances, contraction in the veins in the ears of rabbits was seen from the irritation of the denuded vessels with the scalpel.

These results are sufficient to show that the veins are not insensible to stimuli, though certainly it appears that they are not so readily affected by mechanical stimuli as the arteries are; from which it may fairly be concluded, that they possess a lower degree of contractility.

Some may think these experiments on the veins inconclusive, because in several of them the nitrous acid produced the contraction, which they may contend is a chemical effect. It must be confessed that this objection carries with it plausibility; but the experiments which are now to be related seem completely to obviate the difficulty. If it is supposed that the contraction from the acid is independent of the vital power, it must be allowed that it will take place to as great an extent after death as during the life of the animal. This, however, does not happen, as will appear from the following experiments:—

EXPERIMENT.

Nitrous acid was applied to six of the mesenteric veins of a dog which had been dead more than twenty-four hours. The vessels did not contract, although they became white from the action of the acid. The same experiment was tried in another dog, forty-eight hours after death, and with the same result. It was repeated a third time, on a dog which had been dead seventy-two hours, and also in several other cases. In all the instances

the veins were corrugated ; but no sudden contraction, at all like that which happens from the application of the acid in living animals, was ever produced, provided the trial was made not less than twenty-four hours after the apparent death of the animal ; for, until that period had elapsed, the acid produced a sensible contraction of the vessels ; which may be attributed to their not having then wholly lost their vital powers.

It does not appear at all necessary to follow up the present inquiry by enumerating many other facts, equally strong, in support of the irritability of the blood vessels. The general results of the investigation shall therefore be stated.

1. The blood vessels, through every part of the system, possess a considerable share of irritability, by which they contract and propel forward their contents. Hence the blood, by the action of the vessels, receives a new impulse in the most minute tubes, and a well regulated momentum is preserved in every part of its course. But of all parts of the sanguiferous system, the capillaries seem most eminently endowed with this faculty, and are least indebted to the presiding influence of the heart. Yet even in these vessels we can, with the fullest confidence, maintain that the action of the heart is of consequence to sustain the healthy circulation ; inasmuch as it gives the first impetus to the blood, and preserves the harmony of the sanguiferous powers.

2. The vessels are endowed with this vital property, in order that each organ in the body may receive such a supply of blood as will enable it duly to exercise its functions. It must therefore be evident, that a healthy state of this property is absolutely necessary for the preservation of the animal functions; for if the vital contraction of the blood vessels be either increased or diminished, irregular distribution of the blood inevitably follows, and from this fruitful source numerous diseases arise: none certainly more frequently than inflammation, into the nature of which we shall presently inquire.

But as some of the phenomena of this disease depend upon the intimate connexion between the sanguiferous and nervous systems, some facts on this subject shall be first briefly stated.

It is now an established principle that the action of the heart and blood vessels is independent of the nervous system*. This is abundantly proved by facts. If we take away the spinal cord and brain, the circulation continues for some time in full force. If we remove the heart from the body, it contracts with vigour and alacrity. But although the heart can continue to propel the blood after the removal of the brain and spinal marrow, yet certain states of the nervous system are known to produce effects on the action of the heart. Thus the passions affect the sanguiferous system; spirit of wine

* Dr. Wilson Philip on the Vital Functions.

applied to the brain quickens the action of the heart; tobacco applied to this organ first increases and then diminishes its functions*.

But the influence of the nervous system is not confined to the heart. It extends to the whole series of blood vessels, as has been shown with much ability by Dr. Wilson Philip, in the second chapter of his book on the Vital Functions.

Not only do certain affections of the nervous system influence the heart and blood vessels: the converse of this proposition is also true; for the heart and blood vessels, when acting morbidly, disturb the functions of the nervous system. The proofs, although arrived at in a different manner from those of the first proposition, are equally decisive. They are derived from the following pathological facts.

In children, slow inflammation of the mesenteric glands frequently brings on feverishness and derangement of the functions of the sensorium; thus sometimes laying the foundation of hydrocephalus. Mr. Abernethy has shown, and his testimony is confirmed by several others, that affections of the spinal cord often proceed from diseased viscera.

Mania not rarely arises from disorders of the organs contained in the cavity of the abdomen.

* Dr. Wilson Philip on the Vital Functions.

TREATISE ON BRONCHITIS.

By the term Bronchitis we mean inflammation of the mucous membrane of the lungs, which comprehends an extensive class of affections. It is evident that our knowledge of these affections is intimately connected with that of inflammation in general; of which very different views are taken by some distinguished pathologists of the present time. The author, therefore, feels it necessary to consider that question before he enters on any account of bronchial inflammation.

The facts and observations brought forward in the introduction, respecting the irritability of the blood-vessels, have prepared us to inquire into the state of the sanguiferous system in inflammation.

CHAPTER I.

OF THE GENERAL NATURE OF INFLAMMATION,

In all ages this disease has gained particular attention. Physicians have not been contented with learning from observation solely; they have also indulged in speculation and hypothesis.

Hence sprang the theory of fluxion and defluxion, to which, before the discovery of the circulation, men were chained by the authority of its advocates. On the ruins of this hypothesis Boerhaave built his celebrated theory.

He maintained that an obstruction of the extreme vessels, in any manner produced, may cause inflammation, and particularly that this effect may arise from viscidities of the blood and error loci. Many of the phenomena of inflammation were plausibly explained by this hypothesis, and it was accordingly universally adopted. The decay, however, and final destruction of the humoral pathology, sapped the very foundation on which this view of the nature of inflammation rested.

But the opposers of the theory of Boerhaave did not lose sight of obstruction to the flow of blood in their dissertations on inflammation. Obstruction (supposed, indeed, to arise from a very different cause) forms a principal feature in the theory of Dr. Cullen, who says that "the distention, pain, redness, and tumour attending inflammation, are to be explained only by supposing that the extremities of the arteries do not readily transmit the usual quantity of blood impelled into them by the increased action of these vessels. Such an obstruction may be supposed to happen in every case of increased impetus of blood; but it is probable that in the case of inflammation there is also a preternatural resistance to the

“ free passage of the fluids*.” This resistance he supposed to arise from spasm of the extreme vessels which supported the increased action of the heart and arteries. Dr. Cullen’s great name and authority secured to all his opinions a temporary sway; but his explanation of the phenomena of inflammation was beset with so many inconsistencies, that its insufficiency has long since been acknowledged in the very school which gave it birth.

The theory which stands next in importance and in time is the celebrated one of Mr. John Hunter, who has taken an entirely original view of this disease.

He supposed inflammation in itself is not to be considered as a disease, but as a salutary operation consequent to some violence or some disease. He remarks, that the act of inflammation is to be regarded as an increased action of the vessels, which at first consists simply in an increase or distention beyond their natural size; and this augmentation, he tells us, seems to depend upon a diminution of the muscular power of the vessels, but that this diminution differs from mere relaxation; it is an action in the parts to produce an increase of size to answer particular purposes, which, in Mr. Hunter’s language, is an act of dilatation.

Admitting that this theory explains the phe-

* Cullen’s First Lines of the Practice of Physic. Edited by Dr. Reid. p. 173.

nomena of the disease, it cannot be received; because the opinion that the blood vessels possess an active power of dilatation, must as yet be regarded as devoid of proof, and therefore should not be assumed as a basis on which any theory of inflammation is formed.

At the present day the doctrine most generally taught is, that inflammation depends on an increased action of the vessels.

This doctrine is supported by a review of the several exciting causes of the disease, which, being in general of an irritating nature, must, when applied to living or sensible parts, occasion a preternatural action of the vessels. It is also asserted that the method of cure shows the correctness of this view of the question.

This theory, though taught in the schools, has not been universally received; and one directly opposed to it is advocated by many writers of the present day, who maintain that when inflammation has actually taken place, the distended vessels are in a state of debility.

Vacca, an Italian physician, in a book published at Florence in 1765, first stated this doctrine in a systematic form*. About the year 1790 a

* Vacca delivers his opinions on this subject in the form of propositions, four of which follow: —

PROP. I.

Inflammatio cujusvis partis humani corporis nunquam fit, nisi in ipsâ parte sanguis coacervetur et ferè quiescat.

similar doctrine was stated and ably defended in the Medical Society of Edinburgh, by Dr. Lubbock and Mr. Allen. Professor Thomson has given the following account of Mr. Allen's view of this subject:—

1. The powers which propel and those which retard the blood in its circulation, are so exactly adjusted to one another, that, in the healthy state of the system, the quantity of blood expelled from the veins is precisely equal to what had entered into the corresponding arteries. The forces and the resistances are balanced, so that no accumulation or congestion occurs. If the propelling

PROP. II.

Coacervatio et semistagnatio sanguinis vel alius humoris corporis humani in quâcumque ipsius corporis parte minimè contingere potest, sine ipsius partis absoluta vel relativa debilitate.

PROP. III.

Data eadem partis cujusdam debilitate, non solum coacervatio, et semistagnatio sanguinis fiet, in ipsius partis sanguineis vasculis, ut demonstratum est, verùm etiam canales laterales lymphaticos, et adiposos ipsius partis sanguis ingredi debet.

PROP. IV.

Ex majori collectione sanguinis in vasculis sanguineis alicujus partis, et ex ingressu ipsius in canales tam lymphaticos quam adiposos, et ex ejusdem sanguinis per ipsos atque sanguineos canales lentissimo motu inflammatio morbosa in eâdem parte oriri potest.

Liber de Inflammationis Morbosæ quæ in Humano Corpore fit Naturâ, Causis, Effectibus, et Curatione.

force be equally and proportionally increased through the whole or any part of the series, the blood will move with greater velocity than before; it will be transmitted in greater quantity, but the vessels will contain at no time a greater quantity than usual. This is what is observed to happen after violent exercise. The action of the vascular system is increased; the pulse becomes more frequent and full; for a pulse which when the body is at rest does not beat more than seventy times, may be increased by walking at the rate of four miles an hour, so as to pulsate 140 times in a minute.

In cases of acute or active inflammation, preceded by what is called the phlogistic diathesis, there is an increase of the force of circulation, but not so great as that produced by exercise. The pulse is more full and strong, but sometimes not more frequent than in health. The whole system has often a tendency to spasmodic or permanent contraction. The pulse is frequent, hard, and contracted, does not yield to the heart; and the artery going to an inflamed part feels hard like a cord.

2. In the natural and healthy state of the system, the veins possess a power of impelling the whole of the blood transmitted to them by the arteries. If the muscular action moving the blood be diminished, the blood will circulate with less velocity, and will therefore be transmitted in less

quantity. No congestion will occur, but the quantity of blood will remain unaltered till some change is induced in the structure and capacity of the vessels containing it; and this will happen at length, as occurs in paralytic limbs and in aneurism.

3. If the action of the sanguiferous system be irregularly increased or diminished; be increased in the first, and remain stationary in the succeeding part of the series or continuations of their canals; the motion of the blood would still continue uniform, did the vessels form a rigid tube; but they are extensible and elastic, and therefore the velocity of the circulation will vary with the impelling power. When the impelling power is increased the velocity will be increased, and vice versâ; more blood will be conveyed to the second series than they can easily carry forward to the heart; congestion will take place, and must increase, till the resistance which it affords is in equilibrio with the impelling power of the preceding portions of the arterial canals.

It will follow, therefore, if this view be just, that the congestion will take place in that portion of the series of the arterial system which is next to that acting with the greatest force; and this consequence of the irregular action of the blood-vessels, in whatever way produced, is the first symptom of topical inflammation.

But a simple inequality in the distribution of the

blood is not of itself sufficient to produce inflammation, without the concurrence of other causes. To the production of inflammation, it is necessary that the congestion should stimulate, by its distention, the blood vessels to frequent but ineffectual efforts to carry forward the excess of blood with which they are loaded.

Although Mr. Allen defended his opinions with great perspicuity, and called the serious attention of the public to this view of the nature of inflammation, yet they were supported by no direct evidence, until Dr. Wilson Philip applied the powers of the microscope to ascertain the hidden and important changes which take place in an inflamed part. The honour is consequently due to him of having first had recourse to this mode of investigating the nature of inflammation. At page 17 of the second volume of the third edition of his treatise on fevers, he says: " It is only
" necessary to ascertain whether inflammation con-
" sists in an increased action of the vessels, to
" induce such an action, and observe whether
" inflammation is the consequence. Having adapted
" the web of a frog's foot to a microscope, I now
" and then, during some minutes, observed the
" velocity of the circulation, which continued, as
" far as I could judge, the same. I then wetted
" the foot with distilled spirits, and, in a few
" seconds, observed the blood in all the vessels
" moved with a greatly increased velocity; which,

“ as I constantly kept the web moist with spirits,
“ continued as long as I observed it, ten minutes
“ or a quarter of an hour. But during no part
“ of the time could I perceive the slightest symp-
“ tom of inflammation, either with or without the
“ microscope. The vessels, instead of appearing
“ redder and more turgid, were evidently paler
“ and smaller than before the application of the
“ spirits*.”

After having ascertained that an increased action of the vessels did not produce any of the symptoms of inflammation, the writer states the following experiment:—“ An inflammation had
“ been excited, I do not know how, in the web of
“ a frog’s foot. Having applied it to the micro-
“ scope, I found the vessels of the part greatly
“ dilated, and the motion of the blood extremely
“ languid. In several places, where the inflam-
“ mation was greatest, it had ceased altogether.
“ It was at once evident, on observing the part
“ through the microscope, that where the in-
“ flammation was greatest, the vessels were most
“ distended and the motion of the blood was
“ slowest.”

That he might gain additional proof of the vessels being in a state of debility, Dr. Philip was willing to try the effect of a stimulus to the

* A Treatise on Febrile Diseases. By A. P. W. Philip, M.D., F.R.S.E. 3d edit. pp. 17, 18.

inflamed part, and observes: " With this view I
" wetted the inflamed web with distilled spirits;
" at the same time throwing upon it the concentrated rays of the sun from the speculum of
" the microscope. The blood in all the vessels,
" except in those of the most inflamed part, began
" to move with greater velocity; and in proportion as this happened their diameters were
" diminished, their interstices became less opaque,
" and the redness of the part was evidently
" lessened*."

From the foregoing facts, regarding the state of the capillaries in an inflamed part, Dr. Philip maintains that inflammation consists in debility of these vessels, followed by an increased action of the larger arteries, and is terminated as soon as the capillary vessels are so far excited, and the larger arteries so far weakend, by the preternatural action produced in them, that the power of the capillaries is again in due proportion to the *vis à tergo*.

After having built his views of the nature of inflammation on the firm ground-work of experiment, the writer proceeds to show, that all its symptoms receive a more ready explanation by the doctrine of weakened action of the capillaries than by the commonly received theory of this disease. He afterwards endeavours to point out the distinction between active and passive inflammation;

* A Treatise on Febrile Diseases, p. 19.

which, in his view of the subject, seems to consist in the degree in which the arteries supplying the blood to the debilitated vessels are excited.

No experiments, either to confirm or refute the very satisfactory results adduced by Dr. Wilson Philip, were brought forward, until the year 1813, when Professor Thomson, in his lectures on inflammation, treating on the proximate cause of this disease, related several experiments, instituted to ascertain the nature of inflammation, from which he draws the following conclusions:—“ 1st, That
“ the velocity of the blood, so far from being
“ always diminished in inflamed vessels, is often
“ increased, particularly in the commencement of
“ inflammation; and that this increase of velocity
“ may continue in the capillary vessels from the
“ commencement to the termination of that state.
“ This increased circulation occurs, I am inclined
“ to believe, in a greater or less degree, in that
“ state which has been denominated active inflammation. Secondly, That a diminished velocity in
“ the circulation, through the inflamed capillary
“ vessels, may take place in the very commencement of inflammation, and may continue during
“ the existence and progress of that state. Thirdly,
“ That this diminished circulation in the inflamed
“ capillary vessels takes place, however, more frequently in the progress than at the commencement of inflammation, in healthy and strong
“ persons; and that it is probably a state which

“ occurs in those inflammations which have been
“ denominated passive. The inference, I am
“ inclined to believe, is warranted by the dimi-
“ nution of velocity produced in the arterial
“ branches by repeated applications of salt, or
“ even, in weakened animals, by a single appli-
“ cation. If this view of the circulation in in-
“ flamed vessels be just, it will follow, that inflam-
“ mation is sometimes attended by an increased,
“ and at others by a diminished velocity in the
“ circulation through the capillary vessels of the
“ inflamed part; and, consequently, that neither of
“ those two states ought to be included in the
“ definition which we give of inflammation*.”

Finding such a contrariety in the opinions of the only two writers who have by experiment investigated this subject, it is surely incumbent upon us to attempt to reconcile these jarring sentiments, which will be best done by an experimental inquiry into the merits of the two prevailing hypotheses.

The phenomena of inflammation may be accurately observed by exposing parts to the operation of the most common remote causes, by noticing the changes which occur in the action of the vessels when inflammation is induced, and by afterwards carefully watching the progress of the disease to its termination.

* Lectures on Inflammation. By John Thomson, M.D., F.R.S.E. pp. 88, 89.

From our knowledge of the stimulating effects of those agents which generally produce inflammation, it appears probable that they first excite the action of the vessels to which they are applied: but all stimuli, after a certain period, cease to excite, and then debility almost invariably ensues. The question is, therefore, whether these remote causes produce the symptoms of inflammation during the period of excitement, or that of debility?

EXPERIMENT.

Effects of mechanical Violence on the Web of a Frog's Foot.

July 4, 1817.—The circulation in the web was first observed, and was found quite natural. By scratching with a needle, and occasionally puncturing the web, the motion of the blood was much quickened, and continued so for some time; but the vessels were not enlarged, the globular appearance of the blood was not altered, nor was inflammation produced. This increase in the velocity of the blood's motion was observed for a quarter of an hour. The small vessels in the neighbourhood of the punctures, soon after that time, became dilated; the blood was redder, had lost its globular appearance, and moved very slowly. In half an hour the blood in many of the vessels was nearly stagnant, and the parts near the punctures appeared to the naked eye inflamed.

On the fifth of July the small vessels in the vicinity of all the punctures were still much dilated; the blood, in which no globules could be seen, was a red mass, much resembling the coagulum of arterial blood. The motion of the blood in all these vessels was very slow, and in some of them it did not appear to move, at which part the web was most inflamed. In the part of the web that was not punctured, the motion of the blood continued as at first, and it retained its globular appearance.

On the 6th of July, the small vessels near the punctures were still much distended with an arterial red blood, which moved very slowly. The wounds seemed about to heal. The inflamed parts were very opaque.

On the 7th, the web appeared as on the preceding day.

On the 8th, the punctures were nearly healed, the vessels in their vicinity were smaller, and the blood circulated more freely.

On the 10th, the punctures appeared healed, the vessels were contracted, and the circulation was natural.

This experiment was repeated, with similar results, excepting that the inflammation took sometimes a shorter, sometimes a longer period for its cure.

EXPERIMENT.

The Effects of Heat on the Web of a Frog's Foot.

July 10, 1817.—After having observed the natural state of the circulation, the foot was immersed in water of 110° for half a minute. On bringing it again immediately into the field of the microscope, the motion of the blood in all the vessels appeared quickened, and they were contracted. After an interval of two minutes, the foot was again immersed into water of the same temperature, and for a similar time. The result was as before. After a third immersion of the foot in water of the same temperature, and for the same time, the vessels were dilated, the blood moved more slowly, and was much redder. To the naked eye the web seemed inflamed. For the fourth time the foot was put in water of the same temperature for one minute. The arteries, veins, and capillaries, became greatly dilated, and the motion of the blood ceased, excepting in one artery. The blood was very red, and the web was rendered opaque by the multitude of dilated capillaries. There was a vesicle in the middle of the web, and near it the vessels were more dilated than at any other part. The web to the naked eye seemed much inflamed.

On the 11th the appearances were the same as

those described in the last observation of the preceding day.

On the 12th the vessels had, for the most part, lost their red colour, the blood was become of a yellowish brown hue, and no globules were perceptible. In one or two large veins the yellowish brown coloured blood oscillated. The texture of the web was diminished in firmness.

On the 13th the web was sloughing at the anterior part. In the middle of it a yellowish brown coloured blood still oscillated in the two veins.

On the 14th the whole of the web appeared dead: no motion could be seen in the blood contained in any of the vessels, and it was of a yellowish brown colour.

EXPERIMENT.

The Effects of Cold on a Frog's Foot.

July 14, 1817.—Ice was applied to the web for five minutes. The web became clearer, two of the arteries were contracted, and the motion of the blood in most of the vessels was quickened; but in the veins which received blood from the contracted arteries it moved more slowly. Five several applications of the ice were made to the web, and each application for five minutes. After the fifth application, the arteries, veins, and capillaries, were dilated, the blood was much more red, and no globules could be seen in it. These

appearances continued for half an hour, at which period the foot was immersed in water of 84° . The vessels now again contracted, the motion of the blood returned to its natural quickness, and the inflammation entirely disappeared.

EXPERIMENT.

The Effects of diluted Water of Ammonia on the Web.

July 1, 1817. — My friend Dr. Sims observed the circulation in the web for one quarter of an hour, in order that he might be enabled to judge of any alteration in the velocity of the blood's motion. Diluted liquor ammoniæ was then applied to the web. In five minutes the velocity of the blood's motion was increased, but nothing like inflammation occurred. The same stimulus was again applied for ten minutes. After this all the vessels were dilated, the blood moved more slowly, and the globules disappeared. The web was now much inflamed. In the part of the web untouched by the ammonia the circulation was natural. In two hours after the commencement of the experiment the blood was very red, and did not appear to move, excepting in one artery, and in that vessel the motion was of an oscillatory kind. The web appeared much inflamed.

On the 2d, the blood in most of the vessels was stagnant; in a few it moved very slowly. The

vessels were all dilated with arterial red blood, in which no globules could be seen. The web was opaque from secreted mucus.

On the 3d the blood in most of the vessels was stagnant; they were dilated, and the blood was very red. There were no globules visible. The web was much inflamed.

On the 4th the texture of the web appeared less firm. No motion could be detected in the blood contained in any of the vessels, and its colour was changed to a yellowish brown. No globules were perceptible. The vessels continued much dilated.

On the 5th, 6th, 7th, and 8th, nearly similar appearances to those described on the 4th, presented themselves.

On the 9th the dead separated from the living part of the web. Similar results were seen in several other instances.

EXPERIMENT.

The Effects of Liquor Ammoniaë on the Frog's Foot.

June 24, 1817.—My friend Dr. Archer observed the circulation for half an hour. At the end of that time liquor ammoniaë was applied to the web. In three minutes after the application the smaller vessels became dilated, the blood was changed to an arterial red colour, and moved very slowly. In five minutes the large arterial and venous trunks

were likewise dilated, and the blood in them also moved very slowly. The web to the naked eye seemed much inflamed. In seventeen minutes the majority of the vessels were very red, and the blood was nearly stagnant. In one large vessel it bore its natural appearance, and moved with due celerity.

On the 25th the web appeared inflamed to the eye, and was covered with a dense mucus, which was readily washed away. The blood in most of the vessels was of an arterial red colour, and stationary. In some, which were much dilated, there was a slow oscillatory movement. There were two vessels running across the web not at all dilated, in which the blood appeared healthy, and moved with great velocity.

On the 26th the web was more opaque from the multitude of distended capillaries, in which the blood was of an arterial red colour, and could scarcely be seen to move. In the two vessels described running across the web on the 25th, the blood was healthy, and moved with great velocity.

On the 27th the same appearances were observed.

On the 28th the two vessels mentioned as circulating the blood quickly were dilated: it was of an arterial red colour, and moved very slowly.

On the 30th the texture of the web appeared less firm, the blood was stationary in all the vessels; in many it had become of a yellowish brown colour, whilst in others it still remained red.

On the 1st of July the blood in all the vessels of the centre of the web was quite stagnant, and of a yellowish brown colour. The vessels at the side and edges of the web were rather smaller: the blood in them was still red, and in a few of them moved slowly.

On the 2d the vessels at the sides and edges of the web were regaining their size. The blood moved faster, and the globules began to appear. In the centre of the web the motion of the blood had quite ceased, and it was of a yellowish brown colour. At one point the sphacelated had separated from the living part of the web.

On the 3d the centre of the web had entirely sloughed away. An oval hole was formed in it. The edges of that part of the web from which the dead portion had separated were ulcerated. All around the ulceration the vessels were dilated. In all other parts of the web they were contracted; the blood had resumed its globular appearance, and was moving with much greater velocity.

On the 4th the vessels distributed on the ulcerated part and its immediate vicinity were much dilated, the blood was very red, no globules were seen, and it moved slowly. In all other parts of the web the vessels had nearly resumed their natural size, and the blood moved in them with considerable velocity.

On the 6th the ulcer was healing. The capillaries around the ulcerated part were less dilated,

and the blood rather lighter coloured, but its motion was very slow.

On the 8th the ulceration was healing fast. Small vessels distributed on the ulcerated surface were still dilated, and the blood's motion was slow. It was not so red.

On the 9th the ulceration was healing. The capillaries around the ulcer were less dilated. The blood was still of a lighter colour, but its motion was not so quick as in a natural state. In all other parts of the web the circulation was healthy.

On the 11th the ulceration had nearly healed. The vessels were much smaller, the globules had reappeared, and the blood moved with considerable velocity.

On the 12th the ulceration was healed. The capillaries were as small as at first, and the circulation in the part which was ulcerated was nearly natural. In three other instances, where ulceration was produced, similar results occur.

EXPERIMENT.

The Effects of an incised Wound on a Frog's Foot.

On the 12th of October, 1817, an incision was made in the web of a frog's foot.

On the 14th the wound had not united. The capillaries near the incision were much dilated. The colour of the blood was changed to arterial red, and the globules had disappeared. The motion of the

blood in all the vessels near the incision was very slow, and in some of them it seemed scarcely to move. An artery was observed near the middle toe filled with healthy blood, which moved with considerable velocity; but when its branches approached the part where the incision was made, they were dilated with blood of an arterial red colour, in which no globules could be seen. It moved very slowly. The cut surface was covered with a white dense matter.

On the 15th the capillaries around the incision were dilated with an arterial red blood, whose motion was slow. Small vessels were seen in the white substance which was observed on the wounded surface the preceding day. These vessels appeared connected with the dilated capillaries near the incision.

On the 17th the white dense matter was evidently vascular, for blood was seen moving slowly in the newly formed vessels which were connected with the dilated capillaries in the vicinity of the incision.

On the 19th the vessels around the incision were resuming their usual size, and the globules had reappeared in the blood. The newly deposited substance was increased in quantity, and a slow circulation was now kept up through it from one edge of the web to the other.

On the 22d the vessels near the incision had resumed their natural size. The blood circulated

freely, and the globules had reappeared. The opposite edges of the web were united together by the newly deposited substance, which was nearly as vascular as other parts of the web, and its vessels communicated freely with that part of the web on which it was deposited.

EXPERIMENT.

The Effects of Ice applied to an inflamed Part.

The foot of a frog was immersed in hot water for half a minute, and inflammation was produced. My friend Dr. Macdougall then applied ice to the web for one minute. Immediately after this application the vessels were in some degree contracted, and the motion of the blood was quickened. By a second application of the ice for a minute the vessels contracted in a still greater degree, and the velocity of the blood's motion was increased. When one quarter of an hour had elapsed, during which several applications of the ice were made, the circulation was quite natural.

EXPERIMENT,

Showing the Effects of Oil of Turpentine applied to an inflamed Part.

By the immersion of a frog's foot in water of 110° vesicles were produced, the vessels became dilated, the blood moved slowly, and the whole

web was very red. Oil of turpentine mixed with basilicon, to prevent evaporation, was spread over the web, and retained there for six minutes. The motion of the blood became quicker in several capillaries, which contracted to nearly the natural size. The oil of turpentine was reapplied for some minutes, which caused the blood to move more quickly, and the vessels to contract. At the expiration of an hour (the oil of turpentine during that space of time having been assiduously applied) the blood vessels in every part of the web were contracted, the motion of the blood was quickened, and the inflammation subsided.

In several other instances similar results took place from the application of oil of turpentine, which were witnessed by Dr. Macdougall.

In the foregoing account of the experiments it has been the wish of the author to adduce such as exhibit, in the most striking manner, the rise, progress, and termination of inflammation. The conclusions to be deduced from these facts shall now follow.

It appears that certain stimuli applied to living parts produce an increased velocity of the blood's motion, and a contraction of the blood vessels. During this state of excitement, the part affected is so far from giving any thing like the appearances of inflammation, that the size of the vessels is diminished, and the part is paler.

But if the stimulus be long continued, or increased

in power, the small vessels, which in the natural state admit only of one series of globules, become so dilated as to allow an accumulation of a much less fluid and redder blood in them, which loses its globular appearance, and moves much more slowly than that which previously passed through the vessels. The part now appears inflamed. If the stimulus be removed the vessels do not soon regain their original state; time is necessary to allow them to recover their contractile power, so as to prevent the impetus with which the blood is propelled by the heart and larger arteries from keeping up the dilated state of the capillaries. Here, then, we are obliged to admit, with Boerhaave, that there is an error loci; for a denser and redder blood passes into small vessels, which before carried much more fluid contents: but the error loci does not cause the inflammation, but results from the previously weakened state of the capillaries. In this manner the blood may occasionally be extravasated in inflammation without any actual rupture of a vessel, for the exhalants may be so weakened and dilated as to allow globules to pass through them.

If the stimulus which produces the inflammation be of a very acrid nature, debility of the vessels is frequently induced without any previous excitement. The blood in all the smaller vessels becomes very red, circulates very slowly, and in some vessels stagnates.

The application of a stimulus different from that which produced inflammation will sometimes bring on resolution. When this occurs the dilated vessels contract; they no longer contain a red, dense, homogeneous fluid, but again receive blood, consisting of small, nearly colourless globules, which float in a colourless fluid; and the motion of these globules at length becomes as quick as before the inflammation took place. If, however, the inflammation proceed, the blood becomes nearly stagnant; it continues very red, and the vessels are much dilated.

When this high degree of inflammation is not relieved, sphacelus ensues. The part then feels softer to the finger, and gives way with less force. The vessels are much dilated, the blood does not move, it loses its red colour, and becomes of a yellowish brown hue. The separation of the dead from the living part takes place soon after this change in the colour of the blood.

Whilst the ulceration produced by this separation of the dead from the living part of the web is healing, the capillary vessels, distributed on the ulcerated surface and in the contiguous parts, are much distended with arterial red blood, which is moved very slowly. When the ulceration is healed the vessels become contracted, and circulate the fluids with the same degree of velocity as before the inflammation was excited.

With respect to the seat of inflammation it may

be observed, that the capillaries are first affected; but even the small arteries of the web are also occasionally distended.

Some pathologists, of no small reputation, have of late taught, that the smaller branches of veins are the exclusive seat of inflammation, and have endeavoured to support their opinions by the evidence of morbid dissection. The capillary vessels of the frog's foot, from the greater number of the veins, seem more intimately connected with them than with the arteries: indeed so much so, that the small vessels of the foot at first sight might be called a venous net-work. In the human body also the smaller veins appear to be much more numerous than the corresponding arteries. Hence, when a part is inflamed, the communication of the capillaries with the venous branches is easily traced; and hence some of those who have had recourse to this mode of prosecuting the subject have concluded that these vessels are the peculiar seat of inflammation. But the microscope shows us that the most minute arterial branches, though far less numerous than the small veins, are equally subject to weakness and distention when inflammation occurs.

In the foregoing experiments, if inflammation began and terminated without any lesion of the part affected, new vessels were never formed. After the most attentive scrutiny, the author is induced to believe, that the apparent formation of new

vessels is always caused by numerous capillaries becoming dilated, and carrying an arterial red blood.

In all cases, however, in which inflammation arises from wounds, a whitish matter seems to be deposited by the divided vessels, when they are much dilated and full of an arterial red blood. After this matter has been deposited some time, small vessels can be seen in it, which communicate with the inflamed capillaries of the incised part. Thus, through the medium of these new vessels, a slow circulation is at first effected; but by degrees the recently formed substance becomes more vascular, and then a free communication ensues between the capillaries of the opposite edges of the wound; and the newly deposited matter at length assumes an appearance nearly similar to the rest of the web.

If a thin serous fluid be thrown out by the capillaries in inflammation, and give rise to vesicles, it always happens when they are very much distended with red blood, the motion of which is very slow. This invalidates the recent opinions concerning dropsy; for it shows, that if the effusion do succeed to inflammatory action, it by no means follows that it arises from increased action of the exhalant arteries.

The changes that take place in the appearances of the blood in an inflamed part are very important, but have not been particularly described by those

who have treated of the state of the blood-vessels in inflammation.

In the author's experiments, the weakened action of the smaller vessels was always accompanied with an alteration in the appearance of the blood. In the natural state of this fluid, globules can be distinctly seen; but after inflammation has commenced the globular structure disappears, the blood becomes redder, and the most minute capillaries are distended with it.

Different explanations may be given of these alterations in the blood. The increased redness of its colour may arise from the accumulation of globules in capillaries, which from debility allow a much more ready entrance to them than in the healthy state: or the vital power of the vessels may be so much diminished, as no longer to resist the tendency of the constituent parts of the blood to enter into new combinations. Hence chemical changes ensue.

The rapid manner in which the change in the blood happens, and its return to the natural state as soon as the vessels contract, would seem to favour the former explanation. But it appears very probable, from the following experiments, that a chemical change does take place in the blood of an inflamed part.

EXPERIMENT.

A saturated solution of muriate of soda was applied to the web of a frog's foot. In ten minutes, the arteries, veins, and capillaries, were much dilated; the blood moved very slowly, had lost its globular appearance, and was redder than before the application of the salt. The web to the naked eye appeared inflamed.

In this state of the vessels spirit of wine was applied to them. In five minutes after its application the blood in the venous trunks moved quicker, and they contracted; the blood also contained in them was less red, and globules could again be perceived in it. In ten minutes many of the smaller vessels likewise contracted, and the blood contained in them became less red, and moved more briskly.

At this time a venous trunk was observed, in which the blood appeared healthy, and its motion as quick as previously to the application of the salt. Most of the capillaries also which terminated in this vein seemed in a natural state. Some of the capillaries, however, which assisted in forming it were still dilated, and the blood in them was much more red than that in the vein; no globules could be seen in it, and it moved very slowly. The blood was seen to pass from these debilitated branches into the large venous trunk, and its appearance was very different from that which was

brought by those capillaries, whose action had become healthy. It was deeper coloured, and irregular flocculi appeared in it, which might be compared to small ragged portions separated from the coagulum of arterial blood. When these irregular flocculi had floated for some distance in the blood contained in the venous trunk they disappeared, being either dissolved in the serum or converted into globules. Nearly similar results occurred in two other instances.

In these experiments it is quite evident that some change had taken place in the blood of the debilitated vessels, because it could be distinguished from that which was conveyed by healthy capillaries to the large vein. It seemed to be quite broken down, and to have completely lost its globular structure. This alteration in the structure of the blood seemed to depend on the debilitated action of the vessels in which it was before contained; for it soon assumed its natural appearance when brought into the large venous trunk, whose action was unimpaired.

We may also conclude that the blood of an inflamed part undergoes chemical changes, from a consideration of what is observed in it when approaching to gangrene. It then entirely loses its red colour, and becomes of a yellowish brown hue, which necessarily implies an alteration in its chemical constitution.

From a consideration of these striking facts,

it seems not improbable that the change, which is early observed to take place in the appearance of the blood of an inflamed part, is the commencement of a chemical process, which, if the vessels do not regain their contractile power, ends in the total destruction of the ordinary properties of that fluid. These facts also point out the intimate connexion that exists, in the animal economy, between chemical and vital action, and give new encouragement to those who have been investigating the state of the blood during disease. They convince us, too, that the later speculators in medical science have too much overlooked the state of the fluids; and have, in their zeal for the destruction of the humoral pathology, neglected to keep in view that the chemical constitution of the secretions of a part is altered very considerably whenever diseased action takes place in it.

In the course of this inquiry it has been shown that the healthy circulation of the blood essentially depends on a due degree of action in the vessels throughout the system. It has also appeared that the application of stimuli, whilst it increases the action of the vessels, produces none of the symptoms of inflammation. When, however, the excessive application of these stimuli has impaired the excitability of the small vessels, the phenomena of inflammation are fully manifested; and when their excitability is restored, the inflammation subsides. It may be logically inferred, therefore, that

inflammation consists in a weakened action of the capillaries; by which the equilibrium between the larger and smaller vessels is destroyed, and the latter become distended. Dr. Thomson does not draw a similar conclusion from his experiments, for he conceives that inflammation in moderate degrees consists in an increased action of the vessels. It would appear that this writer's belief in the excitement of the capillaries, in some cases of inflammation, arises from his having denominated that a state of inflammation which really is not so. Let us attend to the results of the minutely recorded experiments as given by that writer.

“ First: The application of the salt produced
“ an increased velocity in the dilated larger and
“ smaller arteries and capillary vessels to which
“ it was more immediately applied. In nine experiments, the phenomena of which I have minutely
“ recorded, the application of the salt was not only
“ followed by a bright red colour, visible to the
“ naked eye, and a sensible enlargement of the
“ arterial and venous branches, but with an
“ increased rapidity of circulation in the capillary
“ vessels; the globules becoming less distinct than
“ before the application of the salt, and obviously
“ less distinct, from the rapidity of their motion,
“ than the globules in the capillary vessels in the
“ uninflamed part of the web in the same animal.
“ The repeated application, however, of the salt
“ to the same vessels was always sooner or later

“ followed by retarded capillary circulation, or even
“ by complete stagnation.

“ A second general result from the application
“ of the salt was an apparent increase of circula-
“ tion in the arteries and veins, with a dimi-
“ nution of velocity in the capillary branches. The
“ diminution of velocity in the capillary vessels
“ seems in every instance to arise from a diminu-
“ tion of force in the circulating powers; and it
“ is in most instances the first visible mark of
“ diminished circulation in the larger vessels: yet,
“ in several experiments with the salt, this dimi-
“ nished circulation in the capillaries seemed to
“ be accompanied with increased velocity of circula-
“ tion in the arterial and venous branches. Here
“ the arterial blood moved most probably through
“ lateral communicating trunks. In no one experi-
“ ment have I been able to perceive any enlarge-
“ ment of an artery during the momentary influx
“ of blood into its canal.

“ The third and most frequent result from the
“ application of the salt, was diminished rapidity
“ of the circulation in the arteries, veins, and
“ capillaries. In seventeen experiments, the phe-
“ nomena of which I have minutely recorded, the
“ circulation became so slow under the application
“ of the salt, as to stop altogether in the capillaries;
“ and this stagnation, which usually goes off in
“ a few minutes, continued, in some instances,
“ for several hours. The enlargement of diameter

“ in arteries, veins, and capillaries, is very conspicuous; they may be said to be distended; and the redness, in retarded or stagnant circulation, is of a somewhat darker colour than that which is accompanied with increased capillary circulation*.”

It appears, then, that there was only in the experiments included in the first result an increased velocity of circulation in the capillary vessels. In those alluded to in the second and third results, in which the inflammation was well marked, it was invariably found that the motion of the blood was diminished in the capillaries.

The following reasons induce the author to believe that inflammation did not come on in the early part of those experiments, included in the first result, which are supposed to prove the increased velocity of circulation in the capillary vessels during inflammation. It constantly happened, in the experiments before detailed, that when inflammation commenced, no globules could be seen in the blood of the affected vessels. It was invariably converted into a bright red homogeneous fluid. So that globules could never be seen in the capillaries of a really inflamed part, much less moving with great velocity. But, independently of all other evidence, Dr. Thomson's declaration, in another part of his work, that all

* Thomson's Lectures on Inflammation, pp. 86, 87.

writers agree in stating that the capillary vessels are much dilated in this disease, seems to warrant us in maintaining, that a sensible enlargement of the more evident arterial and venous branches, attended with a bright red colour, without any dilatation or redness of the capillary vessels, is not a state of inflammation. Besides, the conclusion of the paragraph alluded to favours the same opinion, for he always found that a repetition of the stimulus was followed by retarded capillary circulation, or even by complete stagnation*.

It therefore follows, that the state alluded to by this writer, in the former part of the paragraph, is that temporary excitement of the capillaries, which the experiments of the author have shown generally precedes that debility of those vessels which is inseparable from inflammation. These accurate experiments, therefore, detailed by Dr. Thomson, are conclusive, and confirm those by Dr. Wilson Philip.

The view, consequently, which is here taken of the state of the capillary vessels in inflammation cannot be placed amongst those hypotheses, which have emanated from the closet of the physician, and gained advocates by a specious show of truth, but may be considered as a fair deduction from numerous, varied, and accurate experiments.

With regard to the explanation of the phenomena

* Thomson on Inflammation, p. 86.

of inflammation lately given by Dr. Perry, which supposes an increased momentum of blood, it may be remarked, that that explanation is founded on the opinion which that physician maintains in the 198th paragraph of his *Elements of Pathology and Therapeutics*, that the blood is not moved in the capillaries by any contractile power proper to them, but by the impetus which is given to it from the heart. This view of the circulation in the smaller vessels has been before shown to be incorrect; and, consequently, no time need be here devoted to the refutation of that very ingenious, though rather mechanical, view of inflammation.

The foregoing observations and experiments have been principally directed to the smaller blood vessels, but it is well known that the larger arteries are also affected. The condition of these vessels leading to an inflamed part may be readily ascertained, and it has been long determined that their pulsation is often increased. Mr. Hunter observes, that “although a whitlow take place at the end
“ of a finger, yet we can feel with the hands, when
“ we grasp the finger, a strong pulsation in the
“ two arteries leading to the inflamed part, while
“ no such pulsation can be felt in the other
“ fingers; and, if the inflammation is very considerable, the artery as high as the wrist will
“ be sensibly affected*.”

* Hunter on the Blood Inflammation, &c. p. 278.

Daily observation confirms this fact. In the common instance of *cynanche tonsillaris*, when one tonsil is inflamed this increased pulsation in the carotid of the affected side may be observed. It is not difficult to account for this augmented action of the larger arteries in the ordinary case of active inflammation. The power of the capillaries being greatly weakened, the blood circulates very slowly through them, and consequently must tend to accumulate in the larger arteries. This will be an additional stimulus to them, which will of course assist in producing excitement of these vessels, and in preventing the accumulation from taking place. But the irritation of the nerves of the inflamed part must also have a considerable share in causing the excitement of the larger arteries; for it has been shown that affections of the nerves are felt by the blood vessels.

It is thus we may explain why a greater degree of excitement takes place in the larger arteries, when inflammation occurs in parts that are more intimately connected with the nervous system, (as all the vital parts,) than when it occurs in those which are less so, (as the extremities).

If it be asked, whether increased action of the larger arteries should be considered as a constituent and necessary part of inflammation? the answer must be given in the negative; because cases of inflammation may be observed in which no such excitement can be detected. Without relying on

the experiments above stated, in many of which no increase of velocity in the motion of the blood in the larger trunks took place, every man in practice must have met with cases under the name of languid inflammation, in which no increased action of the larger vessels could be demonstrated. Since, therefore, instances of inflammation occur, uncombined with excitement of the larger vessels, we are warranted in maintaining that, although this state of them may frequently accompany inflammation, it is by no means one of those phenomena which are necessary to constitute the disease.

On this circumstance, it appears, is in a great measure to be founded the very important distinction between active and passive inflammation. A distinction which is of the utmost consequence, and should therefore never be lost sight of by the practical physician. For on it, in a great measure, depends the difference between the ordinary case of acute inflammation of the tonsils, in which there is increased pulsation of the carotid, flushed face, throbbing of the head, excruciating torture in deglutition, with a hard and full pulse; and the less frequent, though not uncommon case, in which there is a gradual increase of size in the tonsil, pallid countenance, no pain or throbbing in the head, difficult, though not very painful deglutition, with a weak pulse. In both of these instances the tonsils are inflamed, but the disease in the one case is very different in its character from that in

the other; and the two affections must be combated by different remedies. The variety in the symptoms seems to arise from the degree of excitement of the larger trunks. In the first case, which is that of active inflammation, there is conjoined with the debilitated capillaries a considerable excitement of the larger vessels; but in the latter, which is a fair example of passive inflammation, the debility of the capillaries is unattended by any sensibly increased action of the larger arteries.

In farther considering the distinction between active and passive inflammation, it may be worth while to attend to the various forms under which the latter happens.

It is a very common termination of acute inflammation. In the acute stage of the disease the larger vessels are excited to contract with more force than in health, but their increased action cannot continue ad infinitum; it must eventually terminate either in the natural action or a debilitated one; and whenever debility of these vessels is produced, if it do not proceed to a great degree, passive or chronic inflammation will be induced. This kind of passive inflammation is often noticed. In ophthalmy, the acute and shooting pains, with morbid sensibility to light, which appear early in the disease, sometimes terminate in a languid, slow, and by no means painful affection, which yields to a mode of treatment not at all applicable to the first stage.

When inflammation comes on in persons previously much debilitated, it will often be of the passive kind; because, from the exhausted state of the body, the excitement of the larger arteries cannot continue long, and the peculiar character of the disease soon unfolds itself. Examples of this kind are not uncommon. Inflammation in the lower extremities of old people sometimes occurs, and quickly terminates without any increased action being observed in the larger trunks. The same thing may also be seen when inflammation attacks those who are greatly debilitated by the depressing operation of some previous disease.

The occurrence of gangrene, as a termination of inflammation, may be readily explained; for the excitement of the larger vessels, in many instances, cannot continue without a great degree of weakness being produced. It is quite evident that under such circumstances the circulation must cease in the part, if the capillaries have not recovered their power, before extreme debility of the larger vessels comes on. From these observations it will appear that gangrene must frequently follow inflammation in weakened habits, because the larger arteries, from their diminished excitability, are more readily debilitated.

In pursuing our investigation, we have been enabled to arrive at very probable conclusions concerning the state of the sanguiferous system; but it must not be forgotten that, before we can be said

to understand the nature of inflammation, it is absolutely necessary to become acquainted with the important changes which occur in the nervous system. Unfortunately the operations of that system are for the most part hidden from our view; and we shall consequently, in endeavouring to trace the share which it has in producing inflammation, have to lament that our knowledge is very confined, the facts hitherto collected being few, and, for the most part, unsatisfactory. We find our ignorance on this subject most embarrassing when we attempt to explain those symptoms which attend inflammation. The doctrine of debilitated capillaries doubtless affords a more rational account of this disease than any of the favoured hypotheses of the day; yet some of its symptoms are so intimately connected with affections of the nerves, that no satisfactory account can be given of them.

The symptoms generally present in an inflamed part, are redness, swelling, pain, and increased temperature.

Dr. Lubbock and Mr. Allen, before any experiments had been made on the subject, maintained that it was impossible to conceive that increased redness of any part could be the effect of excited action. Dr. Wilson Philip also observes: "It
" will hardly be believed that the increased redness
" of the part has been adduced as an argument
" in favour of this hypothesis; for although we
" were assured that this symptom, which can only

“ depend on an increased quantity of blood in the
“ vessels, arises from their increased action, it
“ would be impossible to show how this could
“ happen; how a more vigorous contraction of
“ the vessels can enable them to receive a greater
“ quantity of blood *.”

He further contends, that the redness necessarily follows from weakness and consequent distention of the capillaries.

The dilatation of the capillaries necessarily occasions considerable swelling; because, from the increased quantity of blood in the part, it must occupy a larger space. But there seems another cause which constantly increases the degree of swelling, and that is the deposition of new matter. This may be presumed to arise from the debilitated exhalants allowing a more free transit to the thinner parts of the blood. The interruption also of absorption, insisted on by Soemmering, seems to have some share in producing this effect.

The pain in an inflamed part evidently arises from some morbid state of the nerves; but the cause of this diseased sensibility has been variously stated. When it is considered that the minute fibrillæ of nerves are plentifully distributed on, and intimately connected with the capillaries, and that

* A Treatise on Febrile Disease. By Dr. Wilson Philip.
p. 26.

when any part is inflamed these vessels are much dilated, it must appear evident that the nerves during inflammation are stretched. Now this must be a source of irritation to them, and whenever they are irritated pain is felt. On this view of the subject, the occurrence of more acute pain during the dilatation of the arteries than during their contraction, which induced Mr. Hunter to believe they had lost their muscular powers, may be explained. For it is manifest that the cause of the pain acts with greater force whilst the artery is dilated, because the new volume of blood propelled into the vessels by the left ventricle, must tend still farther to dilate the capillaries, and add to the unnatural tension of the nerves. We need look to no other cause for the throbbing in inflamed parts, which is lessened by compression of the larger arteries; the propulsion of so large a volume of blood into the dilated capillaries being thus prevented.

The advocates for excited action of the vessels in an inflamed part have thought that the increase of temperature favours their hypothesis, and have called to their aid the ingenious calculations of Crawford. They have even gone so far as to say what state of the arteries enables the blood to give out most caloric. They tell us, that in consequence of excitement of the vessels more blood is transmitted into the minute arteries: the capacity

of a greater quantity of this fluid for heat is of course diminished, and more caloric is evolved in the inflamed part. But if it be admitted that pneumatic chemistry has arrived at so great perfection as to allow us to depend on the results in the laboratory of the chemist, and to apply them in the explanation of morbid phenomena, the arguments of Dr. Wilson Philip must be considered as decisively obviating any objections on this head. After having given a statement of the supposed evolution of caloric in an inflamed part, he says:—
“ According to this a very rude, but I believe
“ moderate statement, the waste of the principle
“ by which caloric is evolved from the blood
“ in an inflamed part, is about three times less
“ than in the same part when sound; so that
“ we readily account for the increased temperature
“ and arterial colour of the blood, although the
“ rapidity of the circulation is greatly lessened *.”

But the state of our knowledge respecting the production of animal heat should prevent physiologists from placing much confidence in the unstable calculations of the pneumatic chemist.

The discordance of the experiments related by Dr. Crawford, Dr. John Davy, De La Roche, and Berard, clearly shows that nothing hitherto discovered by the chemist has thrown much light

* Dr. Wilson Philip on Febrile Diseases, p. 30.

on animal temperature. Daily experience convinces us that the temperature is not always proportional to the velocity of the circulation. In fevers the author has several times ascertained, with the thermometer, that the heat was 101° when the pulse beat only 45 times in a minute. In hydrocephalus, with a pulse from 60 to 70, the heat is often above the degree it reaches in health. In these cases, according to the theory of Crawford, the heat should rather be under than above the natural standard.

We can, indeed, scarcely speculate as to the cause of the increased temperature in such cases, without, in some degree, violating that feeling of diffidence which it becomes the votaries of an infant science to cherish, when endeavouring to uplift the veil which conceals Nature's more complicated operations from our view. But, when reflecting on the late experiments on animal heat, as detailed by Dr. Wilson Philip and Mr. Brodie, in the Philosophical Transactions, the author cannot help thinking that such increase of temperature depends on the nerves, and conceives that there is some faint hope that, by assiduously labouring at this uncultivated part of medical science, we may at length be enabled more fully to understand the alterations which take place in the animal temperature during disease.

The application of the foregoing principles to

the treatment of inflammation is so evident, as to render it unnecessary to add any thing on this subject to what Dr. Wilson Philip has said in the following quotation:—

“ The means which promote the resolution of inflammation may be arranged under two heads.

“ 1. Those which lessen the volume of fluid, distending the debilitated vessels by directly abstracting part of it, by occasioning a discharge from, or an accumulation of blood in, some neighbouring part, or by diminishing the vis à tergo.

“ 2. Those which stimulate the vessels of the inflamed part.

“ How well the operation of these means corresponds with the foregoing doctrine of inflammation, need not be pointed out. It is true that, did inflammation depend on a morbidly increased action of the inflamed vessels, it would be relieved by removing part of the fluid which supports this action. But how shall we on this supposition explain the effects of astringents and other stimuli applied to the inflamed part? These, it has been said, exhaust the excitability of the inflamed vessels, and thus lessen their action. But it appears, from the foregoing experiments, that their effect is that of

“ increasing the action of the inflamed vessels,
“ and that it is only in proportion as they
“ have this effect that they relieve the inflam-
“ mation*.”

* Wilson Philip on Febrile Diseases, 3d edit. p. 44.

CHAPTER II.

OPINIONS OF PRECEDING WRITERS RESPECTING
BRONCHIAL INFLAMMATION.

OUR knowledge of inflammatory diseases of the mucous membrane of the lungs is derived from the labours of many writers of all times, from the earliest period of medical science to the present time. Before any attempt is made to add to our information with regard to this class of affections, the principal opinions and authorities extant on the subject should therefore be briefly noticed.

It appears certain that some of the Greek and Roman physicians have described symptoms resembling those which attend inflammation of the mucous membrane of the bronchia; but it does not appear from their works that they had much acquaintance with the nature of the affection, and the descriptions which they give are often vague and unsatisfactory; so that the reader, after pondering over the writings of Hippocrates, Celsus, Galen, Cœlius Aurelianus, Ætius, Paulus Ægineta, and Actuarius, will find little to reward him for the prolixity of his labours.

Neither is there in the writings of the fourteenth, fifteenth, sixteenth, and part of the seventeenth centuries, sufficiently precise information on this

question to induce the author to take up the time of the reader by referring to them.

We need not, therefore, go farther back than the time of Bonetus, who in his useful, though tedious compilation, has recorded some facts which bear upon our subject. In the first section of the second book of the *Sepulchretum* we have several cases of inflammation of the mucous membrane related.

Four patients are stated to have died with great difficulty of breathing, without cough or expectoration, and a tenacious membrane to have been found covering the mucous surface of the trachea, which caused suffocation*. In the same section of his work he informs us, that Spigelius had seen the inner tunic of the trachea inflamed, and the tubes filled with a thin matter, in those who had died of great difficulty of breathing†. This writer also describes a convulsive dyspnœa; which affection, he conceives, arises from the occlusion of the bronchia‡. In an old man, who died of dyspnœa, the cells were filled with ichor, which caused suffocation||.

Our illustrious countryman Sydenham has given a full and perspicuous history of one variety of inflammation of the bronchia. In the fourth chapter of his celebrated work he describes a

* Boneti Anatomia Practica, liber ii. sect. i. obs. 2.

† Liber ii. sect. i. obs. 4.

‡ Liber ii. sect. i. obs. 7.

|| Liber ii. sect. i. obs. 22.

bastard peripneumony, and points out the characters which distinguish it from the true. He attributes the disease to a pituitous matter in the blood, which is deposited in the lungs.

He says, that in the winter, and beginning of spring, old people are often affected with fever, and some of the symptoms of inflammation of the lungs. A cough comes on, and the lungs are loaded with pituitous humours. The patient has a lancinating pain in the head when he coughs, and he frequently vomits, especially fluids. The state of the blood is similar to that which it assumes in peripneumony; and there is a tightness of the chest, with a wheezing respiration.

He recommends blood-letting; which is to be repeated, if absolutely necessary, although old people do not bear this evacuation well. The patient should be bled in a recumbent posture, to prevent fainting. He advises a refrigerant diet, and cathartics, and the free use of pectoral decoctions*.

Frederic Hoffman appears to have described inflammation of the mucous membrane of the lungs under the name of *catarrhus suffocativus*. This affection, he supposes, depends on paralysis of the nerves, which supply the respiratory organs. He particularly notices that the disease arises from repelled erysipelas, and after measles, and small-pox; and that it is occasionally produced by polypi

* Opera Thomæ Sydenham, p. 270.

in the vessels of the lungs*. He points out a certain diagnosis between it and asthma†, and gives a very accurate description of the termination of the disease.

The same writer relates cases of a chronic nature, in which he supposes the tone of the mucous membrane of the lungs is destroyed. This affection begins with cough, slight expectoration, and tightness across the breast; and, by long continuance, so injures the lungs that large quantities of purulent matter are expectorated; and thus phthisis, dropsy, or asthma, is produced. For its cure he recommends stomachic and balsamic remedies, which often remove the expectoration‡.

Morgagni has detailed cases illustrative of the dangerous nature of a very insidious pulmonic disease, which sometimes destroys the patient when there is little appearance of danger||. It is true that he had some doubts whether the disease in question corresponded with the peripneumonia notha of Sydenham; but it does not appear that the symptoms mentioned by the former differ in any essential particular from those described by the latter writer. Morgagni also treats of some chronic affections of the mucous membrane of the air passages. But his pathological labours have

* F. Hoffman, Med. Rat. Syst. cap. vi. tom. ii.

† Cap. iii. tom. ii.

‡ Cap. x. p. 233, tom. iii.

|| Morgagni de Causis et Sedibus Morborum, lib. ii. ep. 21.

not thrown so much light on chronic diseases of the lungs as on those of other viscera, which may be attributed to the fear both he and Valsalva entertained of the communication of contagion to those who dissected the consumptive. We find, however, some valuable observations on those diseases of the mucous membrane which are sometimes confounded with phthisis. Valsalva examined the body of Zani, Bishop of Imola, who was supposed to have died consumptive, having expectorated a vast quantity of matter before his death, and did not find any disease in the structure of the lungs: from which circumstance, he concluded, that the large quantity of expectorated matter came from the mucous surface of the bronchia.

This writer moreover mentions a case of supposed ulcer in the larynx, in which symptoms that had been referred to phthisis had supervened. He cured this patient by keeping him in a warm and spacious room, by forbidding him to speak louder than a whisper, and by a mild milk diet. Several other cases are related, and observations made upon them, which prove that this learned and industrious author had frequently known chronic inflammation of the aspera arteria, and bronchia, mistaken for pulmonary consumption*.

In the anatomical history of Lieutaud there is a case which shows that pulmonary symptoms

* Morgagni de Causis et Sedibus Morborum, lib. ii. ep. 22.

attending measles sometimes solely arise from inflammation of the bronchial membrane. In a child who died of Rubeola the air cells were filled with a pus like fluid, whilst the lungs were quite free from disease*.

The *Précis de la Médecine Pratique* of the same writer contains, under the title *Fausse Peripneumonie*, some observations, from which it appears he considers that Boerhaave and Sydenham have written very confusedly on this subject, and that their descriptions do not relate to the same disease. He says that the false peripneumony exists independently of all other diseases; but occasionally so resembles true peripneumony that they are not readily distinguished from each other. The slightness of the fever, however, and the slowness and smallness of the pulse, will generally serve to discriminate the former from the latter affection. Dissection shows that the bronchia, in the former disease, are obstructed by an effused fluid, and he says the membrane is gangrenous. Prompt relief should be applied. Blood-letting is rarely necessary, it weakens the patient. Emetics are highly beneficial, particularly in nauseating doses. Blisters often produce good effects†.

In the same work Lieutaud describes a disease,

* J. Lieutaud, *Historia Anatomica Medica*, lib. ii. obs. 4.

† Lieutaud, *Précis de la Médecine Pratique*. 2d edit. p. 243.

very similar to the former, which he calls catarrhe suffocante, and divides it into two species. The first of which he considers an affection of the glottis, the second an obstruction of the bronchial cells. He says that old men and infants are extremely liable to the latter, and that after death the trachea and bronchia are found choked up with a mucous matter. Blood-letting is often indispensable. Emetics and purgatives are serviceable; but it is sometimes dangerous to use them. Blisters are very beneficial*.

The rheuma catarrhale of Sauvage does not appear to differ materially from peripneumonia notha. He supposes that in this disease the mucous membrane lining the air passages is slightly inflamed, and accounts for the difficulty of breathing, and tightness across the chest, by the suppression of the aqueous exhalation from the lungs; in consequence of which the cellular membrane becomes distended, and the capacity of the air cells is diminished.

We find in the learned commentaries of Van Swieten several facts and observations relative to affections of the bronchial membrane; but his remarks on this, as on almost every other subject, are but little methodized, being scattered amongst others with which they have not much connexion.

* Lieutaud Précis de la Médecine Pratique. 2d edit. p. 231.

In the description of peripneumonia notha he has copied Sydenham; adding little to what had been done by the latter writer. He tells us that this kind of peripneumony often happens in winter from cold, and in the spring from the supervention of warm weather; that it arises from a thick viscid phlegm, formed in the mass of blood, which chokes up the lungs, causing a very dangerous, and sometimes suddenly fatal disease. It often deceives the physician by its apparent mildness, for there is no intense heat, great fever, or other alarming symptoms, which usually attend true peripneumony*.

As soon as the shortness of breathing and oppression about the breast show that the lungs are choked up, a vein should be opened, for the mass of fluids to be moved through the lungs will be thus lessened. But the frequent repetition of blood-letting, which is so often necessary in true peripneumony, is rather mischievous in the false. After bleeding, a clyster should be immediately injected, and a mild cooling purge should be given, as recommended by Sydenham, every second day. Thin flesh broths are very proper. Warm vapour may be received into the lungs to relax the vessels, and afford a passage to the matter obstructing them; and baths may be applied to the legs and

* Van Swieten Commentaria in H. Boerhaave Aphorismos, aph. 867.

feet, in order that the panniculus adiposus may swell and receive into its cells a large quantity of the ropy phlegmatic matter, which is thus drawn off from the lungs. Large blisters to the legs and thighs, by irritating and inflaming these parts, may be of great service; for they raise up the cuticle filled with ichor, or sometimes with a more viscid humour*.

In other commentaries he mentions several chronic affections arising from disease of the mucous membrane of the lungs. These sometimes supervene on catarrh. For in this disease the membrane lining the nose is frequently so much swelled as to intercept the passage of the air through the nostrils; and if the larynx, wind-pipe, or lungs are affected, a cough is excited, and the breathing becomes oppressed. Those of a weak constitution are more violently affected with these diseases, because their vessels, being less firm, are more readily dilated when any obstruction of the exhalants takes place, and, when once dilated, they do not so readily contract to their former dimensions; so that they sometimes allow the humours, for a length of time, to pass very copiously through them. By this means the whole body is exhausted, and the patient falls into a true marasmus.

This commentator, moreover, details a case,

* Van Swieten Commentaria, aph. 873, 793.

recorded by Galen, in which a patient, eighteen years of age, was affected with loss of voice and spitting of florid blood. After some days a portion of the inner membrane of the larynx appeared to be brought up, but recovery at length ensued. It is also observed, in other parts of the same work, that small aphthous ulcerations of the membrane lining the trachea may produce loss of voice, cough, expectoration, and most of the symptoms of phthisis pulmonalis, and that Diemerbrook had known the disease of the bronchial membrane brought on in three stone cutters; in whom, on dissection, a large quantity of the dust of stones was found in the vessels of the lungs*.

Dr. Cullen has given a very accurate description of peripneumonia notha, but has not added much on that subject to that which had been previously done by Sydenham†.

The disease, he says, has often the appearance of a more violent catarrh; and after the employment of such means as are necessary is often relieved by a free expectoration. In other cases, however, the feverish and catarrhal symptoms are at first very moderate, and even slight; but after a few days they suddenly become considerable, and put an end to the patient's life, when the indications of danger were before very little evident.

* Van Swieten Commentaria, aph. 1199, 824.

† Cullen's First Lines of the Practice of Physic, chap. vii. p. 252.

This writer is of opinion that the disease at first is no other than a catarrhal affection, which in elderly persons is frequently attended with a large afflux of fluids to the lungs; but that the mucous membrane is not alone affected, for there is often some degree of pneumonic inflammation also present. Under these circumstances effusion of serum into the bronchia of old people readily occurs; and when it happens, the exquisite and fatal cases of peripneumonia notha ensue.

With regard to the treatment:—When the fever, catarrhal, and pneumonic symptoms are immediately considerable, blood-letting is proper; but, if they are moderate, this will not be necessary. When effusion is feared, blood-letting must not be repeated. The remedies to be principally relied on are vomiting and blistering. Full vomiting may be frequently repeated, and nauseating doses of emetics should be constantly employed. Cathartics are not recommended*.

The practical observations of Stoll are worthy of our attention. He describes a false or pituitous phthisis as frequently succeeding to peripneumonia notha, in the same manner as true phthisis succeeds to peripneumonia vera. The patients, when this occurs, are generally free from much fever. They have a tiresome cough, which is worse in the evening. The sputa are copious, yellow, and

* Cullen's First Lines, p. 253, 254, 255, 256.

greenish, somewhat resembling pus, but much more tenacious. Paroxysms of difficult breathing frequently happen in the evening and during the night. The emaciation is considerable, and the cutis is rough, dry, and furfuraceous. These symptoms, he says, are relieved by lichen, and cured by the decoction of Peruvian bark*.

Dr. Warren has recorded a case of bronchial polypus, in which the symptoms seem to have arisen from inflammation of the mucous membrane of the lungs. The patient had fever, shortness of breath, and cough without expectoration. On the twelfth day she vomited a large concretion, which was shaped like the ramifications of the bronchia. Several of these concretions were rejected. The patient finally recovered†.

Mr. Chevalier, in the London Medical and Physical Journal, presents some valuable facts regarding the phenomena produced by inflammation of the mucous membrane of the trachea and bronchia. These more particularly merit our attention, since they relate to the appearances on dissection in five cases of this description, and are detailed with considerable minuteness.

The first occurred in a young man twenty years of age. The disease for the first two days wore

* M. Stoll *Ratio Medendi in Nosocomis Practico*, vol. vii. p. 10.

† Medical Transactions, vol. i.

the appearance of typhus, without any local affection. On the third and fourth day great difficulty of breathing came on. He died on the morning of the fifth, having awakened with a sense of suffocation*.

The body was examined nine hours after death. On opening the chest, it was observed that the lungs did not collapse. It was therefore expected that they would be found adhering to the pleura; but this was in no degree the case. The lungs were entirely free from any mark of inflammation, or alteration of structure, nor was any fluid effused into either side of the thorax, or into the cavity of the pericardium. On laying bare the trachea, and making an incision into it, an immense quantity of thin mucus gushed out, with which both it and the bronchia were completely filled; a considerable quantity was also pressed from the air cells of the lungs. The inner membrane of the trachea and its ramifications appeared more vascular than usual; there was no effusion of coagulated lymph, but a few flocculi of that substance were observed in a part of the mucus which was contained in the subdivisions of the bronchia.

The next case was not seen till ten days after the illness had commenced. The patient was forty

* See London Medical and Physical Journal, vol. vii. p. 387.

years of age. He had rigors, difficult breathing, and a small weak pulse.

He took an emetic, and had a blister applied to the chest without any material alteration of the symptoms. On the eighteenth day the breathing was more laborious, on which account six ounces of blood were taken from the arm, but he died the following morning.

On dissection, the lungs did not collapse when exposed, but they were not the least inflamed or diseased in their structure. The trachea and bronchia were completely filled with the same kind of mucus as in the former case, and some was found in the air cells. The membrane lining the trachea had also the same appearance of increased vascularity*.

Two children are the subjects of the third and fourth cases. In these, slight pectoral affections terminated in convulsions and death. The trachea and air tubes were filled with mucus, and the membrane lining them was slightly inflamed.

The fifth happened in a child of two years of age. The attack commenced on the fourth day of the eruption of rubeola. The child became stupid and comatose, the countenance was florid, the breathing was short, and the chest did not contract properly in expiration. Pulse frequent,

* London Medical and Physical Journal, vol. vii. p. 388.

and feeble, but not at all hard. The child died early on the ninth day.

On opening the chest the lungs were found free from every appearance of inflammation or adhesion. The bronchia were filled with mucus, and the inner membrane of the trachea was exceedingly red. The mucus in the bronchia had flocculi of coagulated lymph intermixed with it.

The work of Dr. Badham is the first treatise entirely devoted to inflammation of the mucous membrane of the bronchia. He considers that the promiscuous names under which the different species of this genus of diseases have been confounded, is a strong proof how very imperfectly they are understood. He believes that the catarrhus inflammations of this membrane are chiefly of the asthenic character; but the most striking disease of this genus belongs rather to the acute inflammations. There is, however, a great variety in the degree as well as in the leading character of these affections, and the object of the essay is to notice at large these varieties; which leads him to propose a nomenclature to distinguish the several species; and he therefore appropriates bronchitis to the genus, and distinguishes the three principal species by the epithets of *acuta*, *asthenica*, and *chronica* *.

This writer thinks that bronchitis *acuta* has

* Badham on Bronchitis, 2d edit. pp. 27, 28, 29.

not been before described. Bronchitis asthenica answers to the peripneumonia notha of Sydenham, and others. And under bronchitis chronica, chronic coughs, catarrhus pituitosus, &c. are arranged*.

The history of bronchitis asthenica is first given. It comes on after exposure to cold. The patient complains of oppression and uneasiness in breathing, and of a sense of weight and tension over the breast. The respiration is attended with a wheezing noise. There is, however, no sharp pain in the side, but a diffused soreness. We have a cough, which is without expectoration for the first two or three days, but afterwards a thick frothy mucus is often spit up. A violent tensive pain across the forehead, which is much aggravated by coughing, usually attends. The appetite is gone. The pulse is increased in frequency, diminished in strength, with some hardness. If the disease be moderate the symptoms decline in a week or ten days, but the cough continues for several weeks. This affection is not unfrequently fatal; its danger chiefly consists in its power of debilitating, to a great extent, both the constitution in general and the parts which it attacks. Hence a redundant secretion in bad cases occurs, and the patient is suffocated†.

But it may also become the origin of a spurious

* Badham on Bronchitis, p. 29.

† Ibid. pp. 30—38.

consumption; and the person who sees the disease after it is established, may conclude that he has to deal with ordinary phthisis. If, however, he trace it from its origin, he will often discern that it is essentially different from that disease. Patients in an extreme state of debility, and emaciation consequent to bronchial inflammation, will distend the chest to its full capacity without feeling much uneasiness. They lie down in bed more readily than consumptive patients; and there is not that profuse discharge from the skin which produces the solution of the hectic paroxysm*.

Bronchitis acuta takes place after exposure to cold and moisture. Its commencement is not insidious; it at once shows its formidable character. The patient is attacked with a sense of constriction at the chest, the breathing is anxious and laborious, and a cough soon succeeds; but wheezing is not so common in this as in the former species. The skin is dry, the tongue foul, and the pulse hard. If the disease continue for a few days, the symptoms of excessive action suddenly disappear, the pulse becomes of countless frequency, partial sweats break out, and the patient is suffocated.

In the violence of the symptoms, and the rapidity of their progress, it much surpasses any pleuritic attack. The suddenness of the conversion

* Badham on Bronchitis, 2d edit. pp. 38, 39.

from a state of inflammatory action to that of irremediable debility, is particularly striking*.

In order to exemplify the extraordinary rapidity of the progress of this affection, if not very promptly arrested, Dr. Badham brings forward four fatal cases, which happened in his own practice. In three of these the bodies were examined after death; and in two of them the bronchia were found plugged up by a thick tenacious secretion, and the bronchial membrane appeared much inflamed, but the structure of the lungs was perfectly sound. In the other case, marks of inflammation on the surface of the larger branches of the bronchia were sufficiently distinct; but they were not found full of fluid, although a large quantity of matter had been expectorated by the patient in the course of the disease. After these, two cases are given which this writer obtained from his friend Mr. Copeland, of which there is no accurate history; but examination showed very violent inflammation of the membrane lining the trachea and bronchia, and yet no disease was found in the lungs†.

He thinks the pathology of these diseases is not difficult. The violent pain across the forehead may depend on inflammation of that portion of the mucous membrane which lines the frontal

* Badham on Bronchitis, 2d edit. pp. 46, 48, 49, 51.

† Ibid. pp. 52—55.

sinus. The wheezing noise in respiration does not proceed from a mechanical interruption to the reception of the air; it is owing to a certain constricted state of parts. The occasional exacerbations of the dyspnœa arise from spasm; and the sudden occurrence of extreme debility may be explained by considering that the secreted mucus forms a varnish, which tends to diminish the communication between the blood vessels and the air vessels; and that the blood, so imperfectly supplied, no longer stimulates the heart to a just degree of action. The countenance is not livid, because the action of the heart and arteries is very feeble, and the blood is not propelled in sufficient quantity to give that colour to the complexion. A slightly livid tinge diffused over the almost bloodless countenance, may, however, frequently be seen*.

This author considers that the distinction between acute inflammation of the bronchia and pleuritis is the only point of nicety which can fall under the head of diagnosis.

The peculiarity of the respiration constitutes the least erroneous test. There is no circumscribed pain, the patient can turn on either side without inconvenience, and the inclined posture of the trunk of the body gives no uneasiness. The distress of countenance is much greater than in pleurisy,

* Badham on Bronchitis, pp 85, 86, 87, 89.

and the pulse is frequent, but wants the sharpness and vibration of the pleuritic pulse.

The prognosis is much more unfavourable in acute bronchitis than in pleurisy; and if the symptoms of debility are beginning to manifest themselves, the danger is still greater.

Recent cases of bronchitis asthenica, if there be nothing unpromising in the constitution of the patient, usually do well; but such cases in advanced life frequently terminate fatally. In some the disease degenerates into a chronic cough, the circulation of the blood does not go on with its usual facility through the lungs, and an effusion of water takes place into the chest. From this kind of hydrothorax, this writer observes, many have been recovered by the use of steel, mercury, elaterium, and digitalis*.

He is of opinion that all that can be said of the treatment of bronchitis acuta may be comprised within narrow limits.

At the commencement of the disease blood-letting is the great remedy. It is not, however, so successful as in other acute pulmonary complaints. Twelve ounces of blood taken quickly from a vein in the arm, will, perhaps, generally constitute a sufficient bleeding in a case of moderate violence, and of which the possible conversion to a state of debility is so necessary to be kept in view; but every thing depends on the particular case.

* Badham on Bronchitis, pp. 93—96, 97.

Dr. Badham prefers general to local bleeding. A patient is very seldom more weakened eventually by general than by local bleeding, provided the quantity of blood drawn be equal, though he feel the effects of the former practice more immediately.

A blister should be applied to the chest after bleeding; but it is thought that the powers of this ancient remedy are very limited. Purgatives, as general remedies, are equally serviceable in bronchitis as they are in diseases of the bowels. Diaphoretics are very uncertain; the chance of success, however, is considerably augmented by premising the warm bath. The steady employment of antimonials is of great importance. The inhalation of warm vapour generally occasions fatigue, and it is inexpedient where the respiration is already laborious or painful*.

From analogy this writer is inclined to recommend calomel, and suggests its trial in bronchitis as in croup, in small but frequently repeated doses.

If symptoms of debility succeed to inflammatory action, there is nothing left to the practitioner but to support the failing strength, and stimulate the languid circulation†.

In bronchitis asthenica it is not seldom requisite to commence the treatment by taking away a few ounces of blood; but the disease may often be

* Badham on Bronchitis, pp. 98—100, 102.

† Ibid. pp. 106—109.

more safely combated by means of purgatives, saline medicines, and abstinence. This writer does not, from their extreme uncertainty, think highly of expectorants. Those medicines are most likely to prove expectorant which act generally on the extreme surface; and accordingly antimonials and ipecacuanha are the best remedies of this class. Preparations of the squills appear to be of inferior efficacy to the former, but he has sometimes found a combination of squills, calomel, and digitalis, of material benefit. Where there are occasional aggravations of the dyspnœa, assafoetida often proves useful, and sometimes brings on expectoration, when nothing else will succeed. Seneka is only suited to those cases where the febrile action is gone and debility remains*.

Preparations of volatile alkali are the best remedies in the advanced stages of the disease; fifteen grains of the carbonate of ammonia, with an equal quantity of calumbo, form a medicine from which many have derived benefit†.

The occasional employment of emetics in the latter stages of asthenic bronchitis, is a practice, the utility of which is established. They assist in relieving the bronchia, and often seem advantageous to the whole system. While the general symptoms of fever continue, opium is inadmissible;

* Badham on Bronchitis, pp. 110, 111, 113, 115.

† Ibid. pp. 116, 117.

but when the constitutional affection is gone, and irritability alone remains, it may be used at the discretion of the practitioner.

This disease often leaves so much debility, that tonics are essentially called for. Nothing does so much good as change of air, under which the patient will more sensibly gain ground, after a certain period, than by any combination of medicines.

Having been very full and explicit with regard to the more pressing affections of the bronchia, this writer does not feel it necessary to say much concerning the chronic sub-inflammatory state of these parts, from which mostly arise the variety of coughs with which every one is so familiar*.

This species is chiefly incident to those who are passed the middle of life, and who are debilitated from any cause. A cough comes on early in the winter, which continues for many weeks or months; and the parts often become so irritable that a slight change of temperature is sensibly felt. The patient has always an uneasy respiration, and sometimes a sense of weight or of fluttering, as he terms it, about the pit of the stomach, together with a white tongue, a bad digestion, and an impaired appetite. The sputa are usually copious, viscid, and tenacious; though occasionally they are of moderate consistence, and frothy. There

* Badham on Bronchitis, pp. 119, 121, 122.

is no pain in the chest, the urine is high coloured, and the pulse is weaker and quicker than natural.

We sometimes meet with another variety of this affection, in which we hardly find any constitutional ailment. In such a case, as we can scarcely suspect inflammation, the redundant secretion must be supposed to depend on mere debility of the secretive organ.

As to the treatment of the chronic species, observes Dr. Badham, there is one leading circumstance to direct it; it is always attended with debility more or less, and requires tonics and stimulants. If there be any fever, saline purgatives should be exhibited. The shortness of breath is not considerably benefited by the application of blisters; and the relief afforded is principally confined to the period in which they are exciting the action of the cutaneous vessels. The blisters should, therefore, be applied for an hour or two to make the parts red without producing vesification.

Expectorants are not indicated. The remedies called for are tonics and moderate stimuli, bitters of all kinds, chalybeates in small doses, mineral acids, and change of air. Myrrh is very beneficial, and may be combined with carbonate of ammonia; and in many instances the carbonate of iron, conjoined with some aromatic, is of great use*.

The use of anodynes is almost unavoidable; but

* Badham on Bronchitis, pp. 124—128, 129.

those who are familiar with opium know that they cannot, by its aid, effectually suppress cough; for it depends on causes which opium will not remove. The extracts of hemlock and of poppies mitigate the cough, but do not possess any other claim to superior recommendation.

The preservation of an uniform moderate temperature, during the unfriendly winters of our climate, is of the first importance to the patient. Of the respiration of factitious airs, Dr. Badham has had no experience; but he thinks the advantage of immediate application to the parts would make a trial of them at least plausible*.

In the fourth volume of the Edinburgh Medical and Surgical Journal, Dr. Cheyne has related an interesting case of bronchial inflammation, and has made some general introductory remarks on these affections†. The object which he has principally in view is to notice that affection of the membrane lining the air passage of the lungs, which occasions the formation of those substances called bronchial polypi. They may, he says, be divided into two species. We read of the first only in connexion with hæmoptoe, and it appears to be simply the coagulum of the blood moulded into shape by the bronchial vessel into which it had been poured out. Several cases of hæmoptysis, attended with

* Badham on Bronchitis, pp. 131—133.

† Edinburgh Medical and Surgical Journal, vol. iv. p. 441.

this species of bronchial polypus, are related by medical writers.

Bronchial polypi of the second species differ materially from those before described. They are of a purer white, generally ramified, lamellated, somewhat solid, sometimes tubular, in consistence much more dense. These concretions are generally symptomatic of a disease of a chronic nature. They are preceded by catarrhal complaints, and are attended with cough, wheezing, dyspnœa. The fit of coughing which displaces them, is sometimes alarmingly violent. After the expectoration of these bronchial polypi the lungs feel lightened, as if something which had impeded their play were removed. The disease has been known to trouble the patient seven or eight years, but during this time he has enjoyed many intervals of good health. It is not peculiar to mature age, although it has occurred most frequently in that period of life.

These bronchial polypi are not mere coagula separated from the blood, which had been poured into the lungs. They are produced by a secreting surface in a state of inflammation, and are justly held as analogous to the membrane of croup; yet the action which produces bronchial inflammation never rises to such a height as in croup*.

This view of the disease leads to the cure. We

* Edinburgh Medical and Surgical Journal, vol. iv. pp. 441, 442.

have only to adapt the general indications laid down for the treatment of inflammation to the disease in question.

In the case which is subjoined to these observations by Dr. Cheyne, the constitution of the patient was broken, and the concomitant symptoms were alarming. The active measures pursued removed these, and prevented any return of the polypous expectoration, which otherwise might have become a chronic affection*.

The same writer, in his pathology of the larynx and bronchia, has made some observations on peripneumonia notha. These are designed to show that other diseases of the bronchia (epidemic peripneumonia and catarrh) terminate in that disease; which he thinks generally arises from the connexion of increased action of the mucous membrane with a relaxed habit and weakened organ. He further observes, that all the diseases which terminate in peripneumonia notha are accompanied with increased action of that part†.

Dr. Duncan's observations on the distinguishing symptoms of the different species of pulmonary consumption are intended to establish the division of consumption into three species. In one of these,

* Edinburgh Medical and Surgical Journal, vol. iv. pp. 443, 444.

† The Pathology of the Membrane of the Larynx and Bronchia. By J. Cheyne, M. D.

the catarrhal, the purulent secretion is derived from an inflamed mucous membrane.

This disease begins in a manner very similar to catarrh; the cough, after it has continued some time, becomes very severe, and dyspnœa supervenes. There is no fixed pain in the breast. But the patient complains of a general sense of soreness in the thorax. The expectoration is white or yellow, and acquires a peculiar smell. In most instances blood does not appear in the matter expectorated. By the addition of water, it is shown that this matter is a mixture of pus and mucus; for a considerable portion of it sinks to the bottom in a less tenacious form than that which swims on the surface. It is of importance to determine whether the expectorated matter does really contain any pus or not; for in Dr. Duncan's opinion this is the chief circumstance by which, before the occurrence of distinctly marked hectic fever, the presence of catarrhal phthisis can be determined. Where it is found to be merely mucus, we may safely conclude that the disease is entirely catarrhal; but where a mixture of purulence, though to a small extent only, is detected, we may conclude that it is an incipient phthisis, even although no symptoms of hectic fever have yet taken place, or have not been obviously observed*.

* Observations on Pulmonary Consumption. By Andrew Duncan, sen. M. D. 2d edit. pp. 10, 11, 16.

The catarrhal phthisis may occur at any age; while the two other species, but particularly the tuberculous, are most frequently observed at a certain period of life, between the age of fifteen and twenty-five. There is ground, therefore, for suspecting this species, when symptoms indicating phthisis are observed at that period of life in which the other two are less frequent. Catarrhal phthisis, moreover, takes place with any habit; whilst certain habits are more predisposed to the aposthematous and tuberculous.

But catarrhal phthisis is still more strongly marked by attending to the occasional cause by which it is more immediately produced; for in most instances this modification of pulmonary consumption commences from the obvious action of cold inducing at first a simple catarrhal affection.

In most cases the patient is not affected with any pain at the breast; and, when it does occur, it is not confined to any particular part. It is also peculiar to the catarrhal phthisis, that the dyspnœa is relieved by expectoration, even although only to an inconsiderable degree. Moreover, in this species, the patient, when in an horizontal posture, can lie with equal ease on either side, and the fits of coughing are attended with a copious expectoration, which is not the case in either of the other species of consumption*.

* Duncan on Consumption, pp. 63, 64.

Dr. Duncan conceives that the source of the purulent matter which produces the symptoms is a mere inflamed surface, in some degree similar to that which secretes it, in the case of a blister issue. He therefore recommends us, in the first instance, to diminish the impetus with which the blood circulates through the system in general, and through the vessels of the lungs in particular. This may generally more readily be effected by means which produce a determination of blood to parts at some distance from the lungs, than by an immediate action on their vessels. They are thus strengthened, and the system in general comes into such a state as is most favourable to the perfect restoration of the proper tone of the bronchial vessels*.

In the seventh volume of the Medico-Chirurgical Transactions, Dr. Wilson Philip has described a new species of pulmonary consumption, and is of opinion, that in one stage of the disease the purulent matter is afforded by an inflamed bronchial membrane†.

The cough is at first dry, but as the disease proceeds it is attended with a copious expectoration; and in some cases the quantity expectorated is astonishing. He has often seen half a pint or

* Duncan on Consumption, pp. 73, 74.

† Medico-Chirurgical Transactions, vol. vii. p. 501.

more of pus-like matter, mixed with tough phlegm, spit up daily, when the other symptoms were comparatively mild. Blood often appears early in the disease mixed with a colourless phlegm.

The cough in this species frequently comes on in violent fits; in the intervals of which the patient is often but little troubled with it. These fits are particularly apt to occur after he has eaten. The breathing in the earlier stages of this species of phthisis is sometimes more oppressed by the recumbent posture than in other forms of the disease; but it often happens, in the earlier stages, that there is little or no dyspnœa, and there is very rarely, except in the advanced stages, that marked dyspnœa on exercise, which so frequently attends even the commencement of other forms of the disease. There is hardly ever a fixed pain high in the chest, although in some cases there is an uneasy sensation, and a sense of oppression under the sternum. In many cases the patient is subject to a dull pain in the pit of the stomach. The hectic fever, early in the disease, is hardly ever so completely formed as in other species of phthisis, and sometimes there is a copious purulent expectoration, with but slight fever, and that not assuming the form of hectic; and the emaciation is seldom rapid*.

Superadded to these symptoms of pulmonary disease, we find those indicating a deranged state

* *Medico-Chirurgical Transactions*, vol. vii. pp. 501, 505.

of the digestive organs. The appetite is impaired, the fæces are not well coloured, and the epigastric region is more or less tender on pressure. Such are the symptoms of the more early stages. In its advanced stages all the symptoms which more particularly indicate a tubercular state of the lungs show themselves, and the patient at length sinks with precisely the same symptoms as in other species of phthisis.

He considers that dyspeptic phthisis arises from all the causes which produce pulmonary consumption, with the exception of those whose operation is confined to the lungs themselves. There are also a numerous set of causes, affecting the digestive organs, which may excite this disease. In short, we perceive equally in its causes as in its symptoms its connexion with the state of the digestive organs.

This writer has found the appearances of the lungs on dissection much the same as in other cases of phthisis; but there is, at the same time, either a diseased state of the liver, or traces of disease having existed in it*.

Dr. Philip thinks that this modification of pulmonary consumption may be divided into three stages, in which the prognosis and mode of treatment are different. In the first the affection of the lungs is merely sympathetic, so that when the cause which produces it is removed, it ceases of

* Medico-Chirurgical Transactions, vol. vii. pp. 506—508.

course. This stage is distinguished by the short time which the disease has lasted, and the general mildness of the symptoms; by the fever in particular being very slight; and by there generally being no expectoration but what the cough itself seems to occasion; consisting of a colourless phlegm for the most part, in small quantity.

In the second stage of dyspeptic phthisis the continuance of the sympathetic affection has produced actual disease in the lungs, and there are two ways in which it indicates itself. The most frequent is by some degree of inflammation supervening on the surface of some part of the bronchia, or air cells, in consequence of which the expectorated matter begins to be mixed with small portions of a pus-like substance, which gradually increases as the inflammation extends.

Less frequently small vessels now and then give way, which relieves the inflammatory action, so that the expectorated matter presents no degree of the purulent appearance, but is occasionally mixed with blood. It seems to be at this period that tubercles generally form. These going on to suppuration and ulceration, or the irritated surface of the air cells and bronchia becoming ulcerated, the last stage commences, in which dyspeptic phthisis is nearly as fatal as any other form of the disease*.

* Medico-Chirurgical Transactions, vol. vii. pp. 522, 523.

In the first of the above stages the disease yields readily: indeed so generally successful is a proper plan of treatment, that it required many years' observation to convince this writer that it will not always succeed. Provided there is no great tendency to tubercles, and the hepatic affection is not unusually obstinate, he has found the first stage of hepatic phthisis yield to the usual means of relieving the cough and tendency to fever, combined with such an attention to diet as prevents the stomach being oppressed, keeping up a freer action of the bowels than is necessary in health, and taking care, by occasional doses of blue pill, or of calomel, to preserve a sufficiently copious and healthy secretion of bile.

The second stage of dyspeptic phthisis requires a plan of treatment essentially different from the foregoing. Under such circumstances Dr. Philip recommends us to give one grain of blue pill, combined with some mild stomachic, two or three times in the course of the twenty-four hours, and to continue it either till the tenderness of the epigastric region yields, and a proper secretion of bile is restored, or the gums appear a little redder and fuller than natural*.

With the foregoing he has always combined local means, for the purpose of relieving the tenderness of the epigastrium. If it be not considerable, a succession of small blisters applied over the part

* Medico-Chirurgical Transactions, vol. vii. pp. 525—527.

will be sufficient. If it be so, the blisters should be preceded by the loss of from two to four ounces of blood from the part; from which practice, if the pulse be hard, although the tenderness be not considerable, great advantage often arises. When the disease is obstinate, or has repeatedly recurred, a permanent discharge from the part, especially that by a seton, is often highly beneficial.

For the purpose of lessening the quantity of mercury necessary to be given to subdue the hepatic disease, Dr. Philip has combined with it such other means as tend to promote a regular and healthy secretion of bile. Of all the means which he has employed with this view, he has found none equal to the dandelion. It unfortunately sometimes oppresses the stomach: but when the stomach bears it well, so that the patient can take a decoction of it poured upon chamomile flowers for his common drink, or, what is still better, two or three table spoonsful of the expressed juice in chamomile tea three times a day, its beneficial effects are frequently very striking. When it can be given in the above way, half a grain of blue pill, taken three times a day, often produces as much effect as a whole grain without the dandelion*.

If neither the tenderness in the epigastrium be removed, nor the gums a little affected by the above plan, in about a fortnight the quantity of

* Medico-Chirurgical Transactions, vol. vii. p. 528, 529.

blue pill should be gradually increased, till one of these effects is produced*.

It sometimes happens that the tenderness of the epigastrium is wholly, but the pulmonary symptoms only partially relieved. In this case the hepatic affection is apt to recur, always bringing with it an increase of the pulmonary symptoms, till the structure of the lungs is at length destroyed†.

Dr. Armstrong, in his late work on consumption, has given an excellent sketch of chronic bronchitis, and has endeavoured to point out some certain means of distinguishing it from tubercular phthisis‡.

He notices the common degeneration of catarrh into this affection; of which we are warned by the frequency of the pulse and preternatural heat of the skin, increase of cough, frequent expectoration, and uneasy nights. More or less coagulable lymph is always spit up, sometimes in long thready pieces, but mostly in small glutinous lumps. The cough is most urgent, and the expectoration most copious in the morning. The sputa are frequently streaked with blood. The expectoration is glary in the commencement of the disease, but as the latter advances the former becomes purulent. When pus is copiously spit up, this disease is attended with as much debility and emaciation as tubercular

* Medico-Chirurgical Transactions, vol. vii. p. 530.

† Ibid. vol. vii. p. 533.

‡ Dr. Armstrong on Scarlet Fever, Measles, Consumption, &c.

consumption. And in this stage it is difficult, if not impossible, to distinguish it from the latter*. This writer conceives, however, that during the early stage it may be recognised by its catarrhal character, by there being less wasting of the flesh and strength than in tubercular consumption, and by the concomitant fever not assuming, at that period, the true hectic type. From the commencement there is indeed a slow fever; but night sweats rarely take place till the expectoration becomes purulent, though the skin is occasionally moist and cold in some parts during the remission of the pyrexia. The face has generally a sickly pallidity in the onset of chronic inflammation of the bronchia, and the lips a leaden or bluish hue; whereas in the tubercular phthisis the colour of the face comes and goes, and the lips are commonly tinged with a beautiful bright red. The cough is generally short, tickling, and dry, in the beginning of tubercular consumption, when uncombined with any other disease; whereas in this form of chronic inflammation of the bronchia the cough is deep, and the expectoration free, almost from the first, and continues to be copiously blended with mucus or lymph to the last. There is a stuffing at the breast, which, together with the cough, is much alleviated by a free expectoration. A full

* Armstrong on Scarlet Fever, Measles, Consumption, &c. p. 180.

inspiration does not excite much pain, and the patient can lie on either side in bed. When, however, the abdomen is diseased, which is sometimes the case, there is often a difficulty of lying upon either side. When this combination of disease takes place, it is distinguished by the above mentioned symptoms, and by others which are peculiar to abdominal affections, by the peculiar furred tongue, by the unnatural stools, and by the distention of the epigastrium. Both varieties may arise from measles, from cold, or disordered digestive organs, from vicissitudes of weather, or light clothing*.

Dr. Armstrong observes, that ulceration of the trachea may be a consequence of bronchitis, though it is more frequently the result of a separate and insidious inflammation. In whatever manner produced, it is at first denoted by tickling cough, slight change of voice, obscure uneasiness in some part of the trachea, oppression of breathing, and slowly increasing fever. In the first stages mucus and lymph only are expectorated, but, when ulceration takes place, the sputa are mixed with pus, the patient loses flesh, the throat becomes more uneasy, and the voice thicker. The fever in this affection is of a hectic kind, but the expression of countenance is more anxious than in tubercular phthisis; the mind also is more excitable, and the respiration

* Armstrong on Consumption, p. 182.

more disturbed: there is, however, no fixed pain in the chest, but an indefinable weight at the bottom of the sternum; and a hoarse noise is emitted when the patient takes a deep inspiration. The disease is usually fatal in four or five months after ulceration has come on. Pain in some part of the trachea and purulent sputa are the most certain criteria of ulcer; but the existence of chronic inflammation is marked by the local uneasiness alone; and it is of great consequence to attend to this, as the local uneasiness is sometimes so slight or obscure as hardly to arrest the attention of the patient, even when he is occasionally spitting up pieces of coagulable lymph*.

In the treatment of chronic bronchitis, Dr. Armstrong thinks change of air of great importance; it is indeed often as beneficial in this disease as in whooping cough. There is too much debility usually present to admit of copious general blood-letting, but small venesections and local blood-letting he considers very useful when followed up by blisters. Moreover, if an acute attack supervene, venesection must be promptly had recourse to. The regulation of the diet, which should be of the antiphlogistic kind, is of the utmost importance.

This writer believes that balsam of copaiba

* Armstrong on Scarlet Fever, Measles, Consumption, &c. p. 186.

deserves to be conspicuously placed among the internal medicines. It seems to exert a specific influence over the mucous membrane, it increases the flow of urine, keeps the bowels open, and acts upon the skin. The dose must be gradually increased till the expectoration is facilitated. It sometimes occasions vomiting: this in chronic inflammation of the bronchia is not unfavourable; when, therefore, an accumulation of phlegm takes place, a vomit should always be given.

Excessive purging, he asserts, never fails to be prejudicial, but the bowels should be kept open. Castor oil and Harrowgate waters are the best purgatives. The exhibition of opium alone requires considerable caution, because the cerebral vessels may become affected; but this effect is modified by combining it with calomel, or antimonial powder, or camphor. The combination of opium and calomel, however, is, generally speaking, much less useful in chronic than in acute diseases*.

If hepatic affection be combined with chronic inflammation of the bronchia, small doses of calomel at night and Harrowgate waters are recommended; but in delicate habits blue pill should be preferred to calomel, inasmuch as it is less irritating.

Above all, this writer warns us against exhausting the powers of the patient by too rapid or

* Armstrong on Scarlet Fever, Measles, Consumption, &c. p. 262.

too long a succession of remedial expedients. On this account we should rather endeavour to renovate the powers of the system by a long voyage, or change of climate: if the time of year will not admit of this, the patient will derive great benefit from the temperature of his apartment being regulated.

Dr. Armstrong has not seen the pitch vapour much used, but he has met with one case in which it produced an acute attack of inflammation of the windpipe, and has often known it cause an insupportable irritation there. It appears very probable to this author, that the supposed cases of consumption cured by this vapour were instances of chronic inflammation of the bronchial membrane*.

All the cases of ulcerated trachea which have fallen under his observation have proved fatal, with the exception of two, which were syphilitic. These were cured by throwing in mercury rapidly. But ulcers in this part are generally the result of an insidious inflammation, the symptoms of which are not attended to or understood. When we are called to patients, this author remarks, with hoarseness and disturbed respiration, we should be minute in our inquiries; for chronic inflammation may be

* Armstrong on Scarlet Fever, Measles, Consumption, &c. p. 268.

laying the foundation of ulceration, or ulceration may actually have taken place.

In chronic hoarseness no remedies are so useful as emetics and copaiba, occasional blisters, and laxatives; and in common ulcers of the trachea, copaiba seems worthy of a trial.

To conclude: Dr. Armstrong reminds us, that there is need of accurate arrangements of these chronic affections which resemble phthisis. It is, he observes, evident, that under the term phthisis diseases very different in kind have been comprehended, and it would obviously tend to improve the treatment of those disorders, were their respective causes and nature clearly understood and defined. This is so far from having been effected, that, even among our most useful writers, we find very indefinite ideas on the subject*.

* Armstrong on Consumption, p. 198.

CHAPTER III.

OF ACUTE BRONCHITIS.

WHEN we consider the structure and functions of the bronchial tubes, and reflect that they are constantly exposed to atmospheric influence, we cannot be surprised that the mucous membrane lining these tubes is frequently the seat of inflammatory action. The symptoms produced by this inflammation vary much, in kind and degree, according to the age and constitution of the patient, according to the mildness or severity of the attack, and also according to the length of time it has existed.

It is the author's intention to describe several of these affections, which may be properly divided into two kinds, acute and chronic.

Of each of these several varieties occur.

It is proposed first to give a general history of the symptoms, nature, and treatment, of the several varieties of each kind, and then to relate such cases as bear upon the subject.

Of the Symptoms of Acute Bronchitis.

1. THE common catarrh may be taken for the first variety of this disease, as it is the mildest form

under which inflammation of the bronchial membrane is observed.

In this disease the inflammation of the mucous membrane is evinced by hoarseness, soreness in the trachea, slight dyspnœa, straitness of the chest, and dry cough, which seems to proceed from irritation felt at the larynx.

These symptoms in ordinary cases do not continue long; for, even without medical treatment, the cough is soon attended with a pretty free thin expectoration, which gradually becomes thicker, and is brought up more easily; the hoarseness goes off, the febrile symptoms subside, the cough abates, and the disease soon afterwards terminates.

When the exciting causes and the nature of the symptoms are considered, there can be little doubt that the mucous membrane of the trachea and bronchia is slightly inflamed in catarrhal affections; which opinion is supported by the frequent super-vention of highly inflammatory symptoms on those of catarrh, and also by the common degeneration of this disease into an obstinate chronic affection in persons of delicate habits, when it is not attended to. The cough then becomes very severe, the expectoration copious, and resembling pus; the dyspnœa considerable, the pulse very quick; the patient emaciates, and most of the symptoms of a supervening phthisis show themselves. If the treatment adopted does not check these symptoms, the emaciation proceeds, the expectoration becomes

decidedly purulent, and the pulse rapid. Paroxysms of hectic fever soon come on, and the patient dies of phthisis.

Examinations after death have shown that in most of these cases tubercles are formed in the lungs, and that the mucous membrane lining the air tubes is much diseased. In some instances, however, of this kind, no disease is found in the structure of the lungs; it is entirely confined to their mucous membrane, which is found inflamed, and in some places ulcerated. Much purulent matter is also contained in the bronchia and air cells. These things show that the inflammation of the mucous membrane which accompanies the catarrh sometimes degenerates into a chronic state, and produces the above-mentioned effects.

2. At the same seasons that catarrhal and pneumonic affections commonly appear, and most frequently during sudden changes of the weather, old people, and those of phlegmatic habits, are often attacked with an inflammation of the bronchial membrane, which is much more dangerous in its consequences than that which arises in common catarrhal affections. This disease often deceives by the apparent mildness of its attack. The febrile symptoms are for the most part not severe at first, when compared with those which usually attend pneumonia*. The patient does not complain of

* Case 1.

any fixed pain in the chest, but of considerable uneasiness and sense of straitness there. He is affected with oppression about the præcordia, and the countenance is expressive of anguish. To these symptoms are added lassitude over the whole body, and a general sense of weight and tension over the breast.

The respiration is quick and laborious. It is not generally, at the very beginning of the disease, attended with much wheezing noise; but by degrees, from the accumulation of the secretions, the air cells are more and more filled up, and the breathing becomes more noisy; so that, as Sydenham observes, the obstruction of the larger vessels of the lungs may be perceived by those who stand by. Hoarseness, though not constantly, very frequently attends. The patient cannot take a deep inspiration with the accustomed freedom, and the attempt to do so often brings on considerable cough, or increases the pain, if any exists. Early in the disease the dyspnœa is not aggravated by lying down, and no inconvenience arises from turning on either side; but as it advances, the respiration is more free in the erect posture. Dr. Badham, in describing bronchitis asthenica, remarks: "In addition to this constant dyspnœa, there are cases in which a symptomatic asthma is superinduced. The patient is subject three or four times in the day to a manifest aggravation of the difficulty in breathing; a sudden constriction across the thorax

“ is complained of, which sometimes extending to
“ the larynx, prevails to so great a degree as to
“ prevent the voice from being articulate. In a
“ short time, however, such spasmodic exacer-
“ bations remit, and the complaint resumes its
“ usual level*.”

A cough is one of the first symptoms, and from the commencement is usually accompanied with slight expectoration; though in some cases, in the first stages of these inflammatory affections, there is an unnatural dryness of the parts, the ordinary secretions being apparently diminished. The expectoration is always scanty early in the disease, and does not at all relieve the cough; but in a few days, if the disorder begin to subside, a copious secretion takes place from the inflamed membrane, and a large quantity of thick, viscid, opaque mucus is spit up; after which the violence of the cough is usually diminished. The cough more frequently in this than in pneumonia excites vomiting. This usually relieves the bronchia of very considerable portions of dense white mucus, which are sometimes moulded into the shape of their ramifications. The cough is sometimes very violent, the patient being frequently seized with the most distressing fits of it, which considerably aggravate the dyspnœa; and after their violence has subsided, he is left almost breathless, with a painful sensation of strait-

* An Essay on Bronchitis, by C. Badham, M. D. 2d edit.
p. 32.

ness across the chest. The urgency of these symptoms, however, gradually abates if another fit of coughing do not disturb the respiration. Yet the dyspnœa, in many cases of this disease, is by no means proportional to the cough; the latter being often slight when the former is very severe. The cough and dyspnœa are generally relieved by a copious expectoration, and more especially in those who are in the decline of life, and have been frequently the subject of catarrhal affections.

In almost every instance the cough is accompanied with intolerable pain across the forehead, which seems to depend on the affection of the lungs, for it only abates as the inflammation of the respiratory organs subsides. In many cases drowsiness and vertigo (indicating some fulness of the vessels of the head) attend.

The state of the tongue is various; but it almost always deviates from health. It is often dry, and the whole mouth feels clammy from viscid mucus. The stomach refuses all sustenance, and the thirst is urgent. The urine is sometimes red and turbid, depositing no sediment, and sometimes it is scarcely changed from the natural state.

The frequency of the pulse in the commencement of the disease is often not much increased; but during its progress some fulness and hardness are perceptible, though, in the more ordinary examples, fulness is more characteristic of this affection than hardness; and in those whose constitutions

are impaired by hard drinking, who are frequently attacked with this disorder, the strength of the pulse is often rather diminished than increased.

The temperature of the body is seldom much raised, although the face is often flushed, and evening paroxysms of heat and restlessness come on. The surface is generally dry, unless acted upon by diaphoretic remedies. The blood drawn is, for the most part, buffed.

The duration of this disease is uncertain. It is often difficult indeed to determine the precise time of its commencement, so insidious is the attack. In some cases it terminates in a few days, whilst in others it runs on to a much longer period. In the more violent examples, when the remedies employed do not check the progress of the symptoms, the pulse towards the seventh or eighth day becomes very quick and much weaker; occasional perspirations break out, the nails and lips assume a slightly livid hue, and the countenance is distressed, anxious, and pallid, with somewhat of a purple tinge. In fact, every symptom bespeaks obstruction in the air passages. Soon afterwards the extremities grow cold, and the patient dies from suffocation.

In cases of a less dangerous nature than above alluded to, the more distressing symptoms begin in six or seven days to subside. The dyspnœa becomes less urgent, the cough is relieved, and a copious expectoration of a thick white matter takes place.

But the recovery is always slow, the expectoration continuing for some time, and generally preventing the patient from recovering his strength for several weeks. Moreover, in this state of the disease the bronchial membrane is particularly liable to be affected by atmospheric changes, and thus, not unfrequently, a chronic affection of a very obstinate nature occurs. If, however, the weather be favourable, after the worst symptoms have been removed, the disease often gradually disappears; but not without leaving the mucous membrane much disposed to take on inflammatory action, which will almost inevitably occur when the exciting causes again operate in any considerable degree.

A train of symptoms occasionally appears, very much resembling those of phthisis pulmonalis, and sometimes patients die under these circumstances with every appearance of tubercular consumption; dissection showing a highly diseased state of the bronchial membrane, while the structure of the lungs is not affected. Cases of this description will fall more properly under bronchitis chronica, and all discussion concerning them may therefore be deferred until we speak of the chronic affections of the mucous membrane of the lungs.

It is also by no means uncommon for the cough, dyspnœa, and other symptoms, when long continued, to be conjoined with anasarca and symptoms of hydrothorax, which termination will be particularly considered.

3. In what has been hitherto said of inflammation of the bronchia, it has either been represented as a very mild catarrhal affection, or as arising in old people, or those of phlegmatic habits, in whom the febrile symptoms are not severe, and the disease is not rapid in its progress. The latter corresponds with the *peripneumonia notha*, first so well described by Sydenham. But this mildness of the febrile symptoms is by no means common to all bronchial inflammation. When it takes place in the strong and plethoric, from its commencement it usually produces symptoms of great severity*.

The pulse, the surface, and the tongue, all usually indicate violent reaction, but the countenance is often peculiarly pallid. The progress of this variety of bronchitis is more rapid than that of those before spoken of. Even in this, however, there is rarely a fixed pain in any part of the chest, but a distressing sense of straitness is constantly felt. The breathing is hurried and laborious, the patient only experiencing tolerable ease in an erect posture.

A cough almost constantly attends, but it seldom bears any proportion to the dyspnœa; the former being often trifling when the latter is very oppressive. Some expectoration is generally present in the early stage of this disease; and its cēssation, if the dyspnœa continue, is one of the worst signs, as it shows that there is not strength enough

* Cases 2 and 3.

remaining to enable the patient to relieve the chest from the matter which is poured out into the bronchia; it must consequently accumulate, and at length entirely fill them and the air cells. The skin, says Dr. Badham, is dry, the tongue foul, and the urine high coloured and scarce; the pulse, however, varies in other respects, always hard, the necessity of immediate venesection for the most part obvious.

Wheezing is not so constant an attendant on this as on the second variety. It is towards the close of the one we are describing that this symptom is chiefly noticed.

The stage of excitement, if not met by appropriate remedies, almost invariably terminates in a corresponding collapse of all the powers of the system: orthopnœa takes place, the lips often become purple, the pulse sinks, and is much increased in frequency, the heat of the surface is greatly diminished, the skin is generally damp, and the forehead and chin are bedewed with cold perspiration. Expectoration, from being copious, becomes scanty, or altogether ceases, and the patient dies from the accumulation of the secreted fluids in the air cells. The violence of the dyspnœa, and the tendency of this disease to terminate fatally as early as the fifth or sixth day, form its most striking features.

When vigorous measures are early employed, so as to make an impression on the constitution, these

dangerous symptoms occasionally give way. The dyspnœa abates, the constriction across the chest subsides, the cough is relieved, being attended with a more copious and thicker expectoration, which affords much relief. The pulse, the surface, and the tongue, become more natural, and by degrees the patient is free from present danger. The great debility which has been induced, however, necessarily renders recovery very slow, and frequently a tedious chronic disease ensues; which is characterised by a frequent and violent cough, and a very copious expectoration of a pus like matter. The pulse is greatly quickened, the face is often flushed, particularly towards evening, and in the night partial perspirations break out. To these symptoms is sometimes added extreme emaciation: indeed almost all the symptoms of a supervening phthisis appear, and the death of the patient seems inevitable.

But this chronic affection may terminate favourably, more especially if the summer season set in, and the patient enjoy the advantage of change of air. When treating of chronic bronchitis we shall more attentively consider this termination of the acute disease, and those important circumstances in its history, and in the state of the symptoms which may assist in distinguishing it from tubercular phthisis.

4. There is an acute bronchial attack to which young children are peculiarly subject even more

speedily fatal than the last variety, but it does not produce symptoms of corresponding severity: indeed so deceitful is it, that sometimes, when the danger is really greatest, the physician, from the absence of the usual symptoms of severe pulmonary inflammation, may be led to anticipate a favourable termination of the disease.

It is most common in the spring of the year, and commences as a catarrhal affection, and through its whole course usually retains that character.

The respiration is more frequent than in health, and very generally a wheezing noise may be heard, but the dyspnœa is not considerable, and the patient does not seem uneasy in the horizontal posture; in fact, is not more distressed in these respects than is customary in a severe catarrh. A cough always attends; but it is often slight, and is rarely accompanied with any expectoration, unless vomiting is produced.

The tongue is often loaded, but sometimes it has a natural appearance. The child rarely refuses sustenance, and the fever in many cases is not considerable. The pallidity of countenance is very remarkable, and is for the most part observed soon after the attack commences. Early in the attack we often find the pulse hard and frequent; but the hardness in the majority of cases soon goes off, and the frequency alone remains.

As the disease advances there is often an extraordinary variation in the state of the breathing and

pulse. The breathing for several hours occasionally appears so free and easy as to lead the practitioner to expect that he has subdued the disease, and that the child will recover, when suddenly a great aggravation of the difficulty of breathing takes place, so as sometimes to threaten immediate suffocation; but by degrees the urgency of the dyspnoea subsides, and the breathing apparently becomes in some instances even nearly natural, and remains so till another aggravation of the symptoms occurs, which may not happen for a considerable time. These remissions and exacerbations continue throughout the disease. During the remissions the child often dozes, and is not much distressed by the cough. The state of the pulse evidently, in a great degree, depends on that of the breathing. During the exacerbations it is very much quickened, and is often fluttering; but as the urgency of the dyspnoea remits, it generally becomes much slower.

The disease is not stationary, the symptoms soon become more distressing. The aggravations of the difficulty of breathing are more alarming, and the remissions less perfect. The child often falls into a comatose state. A slightly livid tinge makes its appearance on the lips, from which the pallid cheeks are not entirely free. Even at this late period gleams of hope sometimes burst upon us. For a short time the difficulty of breathing may seem to subside, and the child to be better. But

these hopes are never realized; even the next exacerbation of the symptoms may terminate in suffocation.

In the more urgent cases the course of the disease does not take up more than seventy-two hours; and in those whose progress is not so rapid it usually terminates in less than five or six days*.

5. The connexion of bronchitis with cutaneous diseases, which may now be noticed, presents some important facts.

The occasional occurrence of pulmonic affection during an attack of erysipelas, or after this disease has left the skin, is distinctly mentioned by several writers. It was well known to the father of medicine that those who are the subjects of an erysipelatous inflammation of the skin sometimes die of pulmonic affection.

While the author was resident as House-Surgeon in the Worcester Infirmary, erysipelas several times made its appearance in the wards of that institution, and was particularly prevalent amongst the surgical patients. The disease was often of a severe nature, and the attendant fever frequently assumed the typhoid character; more especially when the neglect of early evacuations, and in some instances the administration of stimuli, had contributed to lengthen the duration of the disease.

Under such circumstances, the occurrence of

* See Case 4.

visceral inflammation was by no means uncommon; and unless vigorous measures were speedily adopted, it did not require much foresight to prognosticate the fate of the patient.

Each of the three great cavities was, perhaps, equally liable to be attacked; none certainly were more so than the viscera of the thorax.

It did not appear that the internal organs were at all more apt to feel the effects of this disease when it left the skin than at any other part of its course; for in some instances the external inflammatory action proceeded in the ordinary way, although, at the same time, there were the most decisive marks of the internal parts being affected.

But to apply these observations to the subject before us:—Dissection, in two cases of death from pulmonic symptoms accompanying external erysipelas, proved that the mucous membrane, lining the air tubes, was highly inflamed, and that the effusion of a bloody serum and mucus into the bronchia and air cells had occasioned suffocation. These cases were very rapid in their termination, and the attendant dyspnœa was very distressing*. In one of them the disease was not confined to the mucous membrane of the lungs, it extended to the serous membrane investing the organs of the thorax and abdomen†.

In all the cases in which the chest was affected,

* Cases 5 and 6.

† Case 6.

during the existence of erysipelatous inflammation, the breathing was hurried and laborious, the countenance anxious, and the cough, which was soon attended with a slight expectoration, troublesome. As the disease advanced, the expectoration, which was always productive of relief, often became more copious. The surface was hot, the tongue dry, the pulse hard and frequent, but generally small, and the bowels irregular. Blood-letting and evacants relieved these symptoms, but they were invariably aggravated by the stimulating plan, which was sometimes had recourse to. When appropriate remedies were not vigorously employed the disease soon proved fatal, the dyspnœa increasing to an alarming extent, and in four or five days terminating in suffocation.

Rubeola is another cutaneous disease, in which the lungs suffer very severely. The secondary pectoral symptoms often prove fatal to children, who have gone through the eruptive stage of this disorder without much alarm. From all the facts we are acquainted with, it appears that such pectoral attacks usually proceed from inflammatory action in the bronchial membrane.

In children this disease is often very insidious. In all cases after the decline of the eruption, it is expected that the cough will continue some time. Hence, more especially in the lower classes of society, parents are not attentive to the primary attack, for they consider that in the usual course

of the disease the lungs must be affected, and that the symptoms will soon abate. The inflammation is thus allowed to take deep root before the patient is seen by the medical attendant; and this is more particularly apt to occur when the digestive organs are disordered*.

In such cases the great difficulty of breathing is the most striking symptom; it is hurried and anxious, and the unnatural action of all the voluntary muscles which are subservient to respiration is very conspicuous. A wheezing noise is often heard. Sometimes, in the worst cases, there is scarcely any cough; but more commonly it is violent, and generally comes on in paroxysms. It is rarely attended with expectoration, unless from its violence vomiting be excited. The thirst is great, the surface hot, the pulse quick and generally hard, the tongue loaded, and the bowels constipated.

The foregoing description exhibits the violent symptoms which occur when this inflammatory bronchial affection is most severe; but it frequently happens that the attack is of a much milder nature, and similar symptoms less strongly marked then show themselves. It seemed better, however, to represent this affection in its most formidable character, as from such a representation the slighter attacks may be readily comprehended.

Children rarely recover when the symptoms are

* See Cases 8 and 9.

such as above described, for the bronchial tubes are soon filled with the redundant secretion. No means can relieve them from this load, and death ensues in consequence of the necessary changes in the blood not being effected. For some time previous to the fatal event, the blueness of the lips and leaden complexion usually announce the obstructed state of the air tubes, and warn us of the approaching termination of the disease. In some rare cases, however, this blueness of the lips and leaden countenance accompany the first attack of difficult breathing, which then always ushers in an unusually violent disease.

In one case which fell under the author's observation, dyspnœa and a general blueness of the skin came on soon after the disappearance of the measles in a child of three years old. It lingered a week after this had taken place. On dissection the lungs were found much loaded with blood, the bronchial tubes quite filled with tenacious mucus, mixed with a pus like matter, and the mucous membrane very much inflamed. Neither the pleura nor the substance of the lungs was inflamed.

Sometimes this attack commences with symptoms in some degree resembling croup. Two cases of this kind have occurred in the author's practice. The subjects were children of about four years of age. Soon after the decline of the eruption of measles they were affected with dyspnœa, cough, and loss of voice; and emitted during inspiration a

shrill sound. When vomiting was induced, a great quantity of phlegm, but no white membranous substance, was brought up. One of them recovered under the use of leeches, blisters, and emetics; the other died in a week after the dyspnœa came on. By dissection, the mucous membrane of the glottis, trachea, and bronchia, was found much inflamed, and the air passages were filled with tenacious mucus and a bloody fluid; but there was no membranous substance in the trachea.

In almost all cases of inflammation of the bronchial membrane accompanying, or succeeding to, the eruption of measles, the disease is of a more obstinate nature than when it arises from cold; and it often creeps on without at first exciting much disturbance in the system. An unregarded cough and copious expectoration sometimes gradually waste the powers of the body, and the patient is brought to the verge of phthisis before danger is apprehended.

In other examples, where symptoms of considerable inflammation of the chest appear in the eruptive stage of the disease, and are combated by appropriate remedies, it not uncommonly happens that although the more prominent symptoms are subdued the inflammatory action in the diseased membrane is not entirely overcome; for months afterwards the cough may continue, with dyspnœa, copious expectoration, and general emaciation, giving reason to dread that the disease may terminate

in phthisis. Under such circumstances, if the summer season set in, and the patient enjoy the advantage of change of air, these gloomy anticipations are frequently dispelled by perfect recovery*.

It has been long observed by writers that the cure of chronic diseases of the skin sometimes causes attacks upon the lungs of a violent nature: it seems probable that further observation will show that such cases are referrible to inflammation of the mucous membrane of the bronchia. The only instance of this description, in which the author has ascertained the state of the parts after death, decisive marks of inflammation in the mucous membrane were discovered, while the structure of the lungs was quite free from disease†.

6. The symptoms which attend the foregoing varieties of inflammation of the bronchial membrane are sometimes complicated with diseases of the abdominal viscera.

This combination is frequently observed in the second variety when bronchitis arises, as it often does, in those who have fallen into a bad habit of body from a too free indulgence in spirituous liquors. In these cases a disease of the liver is brought on, which by the irritation it produces in the mucous membrane of the lungs, often excites inflammation there. If this occur, we have, in

* See Case 7.

† See Case 12.

addition to the pulmonic symptoms above described, the various symptoms indicating a languid hepatic affection.

The right hypochondrium feels fuller than the left, and there is some degree of tenderness in that part. The patient also often complains of a sense of oppression of the stomach, nausea, a bitter taste in the mouth, and a giddiness and pain in the head; and the fæces are frequently dark coloured and foetid.

Sometimes the disease begins with shivering, headach, trembling, and bilious vomiting; which after a day or two are succeeded by difficult breathing and cough.

Very frequently a chronic disease of the liver is co-existent with the several varieties of bronchitis above described; but no corresponding symptoms being produced, it is not detected till after the death of the patient*.

It is by no means an unusual occurrence to find the more severe bronchial inflammations accompanied by those symptoms which denote acute hepatitis. Pain is felt in the region of the liver, with a sense of tension in that part. The hypochondrium is tender on pressure, and the skin and urine are sometimes tinged with yellow. The mouth is dry, and the tongue is covered with a yellowish crust. The bowels are irregular; in

* See Case 1.

general constipated, but occasionally a diarrhœa attends, and the dejections are dark and fœtid. In no cases does this combination of acute hepatitis and bronchitis more commonly occur than when inflammation of the mucous membrane of the lungs succeeds to rubeola*.

Gastritis now and then accompanies acute bronchitis. The general debility is then much greater than in ordinary cases. There is a very acute pain in the stomach, which is increased by taking any thing into it, or by slight external pressure. The pulse is frequent, small, and contracted. The thirst is urgent. The mildest fluid is very soon rejected. The bowels are generally constipated †.

Inflammation of the peritonæum is also sometimes combined with that of the mucous membrane of the lungs, and produces its usual symptoms.

7. We shall now speak of bronchitis as rendered obscure by co-existing diseases, and as unattended with its usual symptoms.

There is no disease which more commonly occurs in conjunction with bronchitis than chronic inflammation of the larynx and upper part of the trachea.

It is well known that the almost constant termination of chronic inflammation of the windpipe, if not subdued by early and active treatment, is an incurable ulcer.

* See Case 9.

† See Case 17.

Both in the early stage of this chronic disease, and when it has terminated in ulceration, bronchitis is very likely to arise from exposure to cold, or some other cause, and sometimes speedily destroys the patient.

The symptoms which denote the first attack of chronic inflammation of the trachea, which is very insidious in its approach, are a tickling cough and tenderness in some part of the trachea, pressure generally producing a cough. The voice is always changed, the patient often speaking in hoarse whispers. The pulse is accelerated, fever for the most part attends, and a dense mucus is often expectorated.

If the disease proceed to ulceration, the voice becomes more affected, the pulse is greatly accelerated, and the cough is harassing, and attended with a copious purulent expectoration. The countenance expresses great anxiety, and the respiration is laborious; but no pain is felt in any part of the chest, though it is often referred to the epigastrium when the dyspnœa has continued long.

During any period of the existence of this chronic disease, as we have before observed, exposure to cold or some other cause may bring on a severe attack of active inflammation, which is not confined to the seat of the chronic disorder, but seems to diffuse itself over the whole of the mucous membrane. The symptoms of bronchitis then become mingled with those of chronic disease of the trachea.

We have superadded to the before mentioned symptoms a distressing straitness across the chest, a more aggravated dyspnœa; and frequently the lips and other parts are slightly livid. The attendant fever also becomes much more severe, and the pulse more accelerated.

If this inflammation be not speedily checked, the patient does not survive long, suffocation ensuing, as in Case 13. If fortunately we are by vigorous measures enabled to remove the active inflammatory attack, the chronic disease of the trachea remains, and either slowly destroys the patient, or yields, as in the 14th Case, to a long course of medicine.

But there is no form under which inflammation of the bronchial membrane is more distressing, or more fatal in its consequences, than that which arises from tumours pressing on the windpipe, and involving it, and the whole of the mucous membrane lining the air passages. Bronchocele not very unfrequently produces these effects.

It is well known that in ordinary cases of this disease, when the tumour has gained a great size, it generally occasions difficulty of breathing, which is increased on the patient's taking cold; and in some instances the breathing is attended with a loud wheezing noise. In such cases, when the external tumour remains unaffected, and does not become painful or tender to the touch, little danger is to be apprehended; but subjects are occasionally

met with in whom the tumour, though not very large, is much firmer than those we have before noticed. In these there is frequently a considerable degree of inflammatory action, in which the cellular membrane and lymphatic glands of the neck are often implicated. Hence they become thickened and enlarged. In such cases it is not unusual for a cough to come on, accompanied with wheezing, hoarseness, sense of straitness across the chest, heat of surface, and accelerated pulse; which symptoms but too often terminate, as in the 15th Case, in orthopnœa, purple skin, sunk countenance, cold perspirations, and death.

We have been enabled to recognise bronchitis, as hitherto described, although obscured by other diseases, either from the previous history of the case or the absolute state of the symptoms; but it would be an error to conceive that bronchitis always presents itself with strongly marked features. The truth is, that in many examples it is met with under such circumstances as to be with difficulty, or not at all, distinguished from the co-existing disease.

Sometimes it is complicated with a multitude of other phenomena. Sometimes its commencement is imperceptible, its progress insidious and obscure, and its termination slow. Sometimes scarcely any of the symptoms of bronchitis appear; the patient is visibly affected with some other disease, which seems to prove fatal; and the inflammation of the

bronchia is not discovered till after death*. Sometimes its abrupt attack, its rapid course, and its combination with inflammation of the lungs, pleura, pericardium†, or heart, do not allow us, with any degree of certainty, to fix the character or seat of the affection.

Of the Appearances on Dissection.

There is a diversity in the appearances which are presented after death in the various forms of the disease we have spoken of. In the more severe cases, where there has been much excitement, and the disease has terminated speedily, the lungs in general do not collapse when the thorax is opened, although the pleuræ do not adhere. The structure of the lungs, however, usually appears quite sound, and free from any mark of inflammation. Nor is there generally any fluid effused into either side of the thorax, or into the cavity of the pericardium. But evidences of inflammatory action are found in the bronchia. On removing the integuments from the trachea, and making an incision into that part, it is often found full of fluid, which is sometimes purulent, and at others consists of serous matter, with which coagulable lymph or mucus is generally mixed. The bronchia are, for the most part, plugged up by purulent matter, or tenacious mucus, or bloody serum. In all such cases, when an

* See Cases 18 and 19.

† See Case 16.

incision is made into the substance of the lungs, (which, as above noticed, do not collapse on opening the chest,) a frothy fluid escapes. In a few instances no fluid is discovered in the trachea, bronchia, or air cells, although the mucous membrane is very much inflamed. Sometimes the trachea and bronchia are quite filled with a substance resembling the polypous concretions so frequently found in the heart after death.

The mucous membrane lining the air tubes is evidently much inflamed. The capillary vessels, are always red and dilated; and it occasionally happens that they are so red and dilated that the mucous membrane appears like a congeries of blood vessels. When the disease is not so rapid in its course, the whole of the mucous membrane does not always appear inflamed. Patches of it are sometimes much redder than natural, but in the interstices the membrane retains its usual colour. In these cases a very considerable quantity of serous fluid is usually poured out into the air cells.

In examining the lungs of those who die of the pectoral symptoms that succeed to rubeola, inflammation of their substance is sometimes detected, but the bronchial membrane is more frequently the exclusive seat of this disorder; in which event the trachea and bronchia are filled with mucus, and the inflammation of the membrane often appears in patches, which approach nearly to the shape of a crescent.

When bronchitis succeeds to pustular cutaneous diseases, the mucous membrane is sometimes affected with minute ulcerations, and the whole of its texture appears much redder than natural.

In those who die of the pectoral symptoms, which sometimes arise during the progress or on the decline of erysipelatous inflammation of the skin, the mucous membrane of the lungs is very red, and the trachea and bronchia are filled with serous fluid and mucus.

If patients die of an affection of the respiratory organs during the course of variola, different appearances are observed, according to the period of the disease at which the fatal event occurs*. It is common, if death happen at an early stage, before the vesicles are formed, to find the trachea full of fluid, and the mucous membrane of the lungs exceedingly red from the dilatation of its capillary vessels. The glottis too, and the upper part of the trachea, are sometimes highly vascular, and the inflammatory action often extends to the pharynx; but neither the pleura nor the substance of the lungs appears inflamed. If the patient die at a later period of the disease, when the body is covered with pustules, ulcers are occasionally met with in the mucous membrane, corresponding in size with the pustules that are formed in the skin. The glottis and pharynx are still more affected than

* See Cases 10. and 11.

when the patient dies earlier; sphacelus of those parts occasionally occurring. The structure of the lungs is often entirely free from disease, and there are no adhesions. The lungs, however, do not collapse when the thorax is opened, and when cut into, a frothy matter escapes from them. The blood vessels of the lungs are always much loaded.

The structure of the lungs, though it does not usually, yet sometimes suffers from inflammation as well as the bronchial membrane.

The diseased parts are then redder than usual, the colour being partly florid and partly of a darker hue. The inflammation sometimes extends so far in the structure of the lungs as to cause a collection of pus; and sometimes the lungs are much harder than natural, and sink in water.

When the pleura is inflamed, which not uncommonly happens in conjunction with bronchitis, it is often covered with a white incrustation, or the cavities of the thorax are filled by effusion.

Adhesions are generally found, few cases occurring in which some of them are not detected.

The heart and pericardium in some instances adhere together, while in others the aqua pericardii is more abundant than in health. Vestiges of inflammation are even sometimes found in the heart itself. The membrane lining its cavities is more particularly the seat of inflammatory action. Coagulated lymph is occasionally found on the auriculo-ventricular valves. The cavities of the right side

of the heart are for the most part larger, and contain more blood than usual.

The abdominal viscera are not unfrequently found diseased in those who die of bronchitis. The stomach is sometimes inflamed, and occasionally ulcerated. The liver is in some cases indurated, of a lighter colour than natural, and enlarged; in others its peritonæal coat is inflamed and thickened.

The spleen and the pancreas may also exhibit morbid appearances.

Every part of the peritonæum is now and then in a morbid state. Its whole surface is granulated; the intestines are united together and covered with a white incrustation; and a milky puriform fluid is contained in the cavity of the abdomen.

The blood vessels of the head are generally in a congested state.

Of the Nature of the foregoing inflammatory Affections of the Bronchia.

There are several symptoms in these disorders which are common to inflammation of the bronchial membrane and to that of the structure of the lungs.

The dyspnœa and cough are among these. There are some symptoms which are confined to the former disease which require to be considered. The wheezing is peculiar to bronchitis, and is more common in that variety of it which is known by the

name of peripneumonia notha, than in any other. It is not, however, confined to that variety; for it comes on in the latter stages of all bronchial inflammations. When the disease attacks old people, we always hear this noise soon after its commencement, and it diminishes when a free expectoration is established. For this reason Dr. Badham thinks that the usual mode of accounting for this symptom, which ascribes it to a redundant secretion of mucus, should be rejected. He conceives, that it is owing to a certain constricted state of the parts, to a greater rigidity and straitness than is natural, excited by the inflammation which affects them.

If this explanation were correct, the wheezing noise ought to occur in all cases where the membrane becomes much inflamed; whereas the truth is, we rarely hear it early in the disease, except in old people and young children, in whom the secretions, even in health, readily accumulate in the air passages.

Perhaps the proof which Dr. Badham adduces in support of his argument is the best that can be brought forward to show that the wheezing depends upon a redundant secretion of mucus; for he says that it is most distressing before the patient begins to expectorate, and is always relieved by a free expectoration; and that in the stout and robust, in whom this wheezing noise does not occur early in the disease, it never fails to take place at a later period, when the bronchia can no longer

unload themselves of their secretions, which, consequently, accumulate in the air cells.

The occasional exacerbations of dyspnœa, in some of the varieties of bronchitis, the same writer explains by supposing that some cause excites spasm in the inflamed surface of the bronchia, which is constantly predisposed to it; and thus fits of dyspnœa are very often induced. It appears equally consistent with probability to give a more simple explanation of this circumstance, and one that does not oblige us to admit any supposition that is not supported by the structure of the diseased part. It is clear, that if from any cause the quantity of mucus is at any time increased, there will be a greater mechanical interruption to the reception of the air; and a greater degree of dyspnœa will consequently be induced, which may be relieved by the absorbents removing a part of the redundant secretions, or by a more free expectoration.

It is not so easy to explain the cause of the rending pain across the forehead, which so constantly attends the second variety of inflammation of the bronchia.

It is said by Dr. Badham that this pain may depend upon an inflammatory state of that portion of the mucous membrane which lines the frontal sinus. But if this were the case, we should surely sometimes meet with those results which attend inflammation. We should occasionally meet with suppuration, which is never known to occur. It

seems more likely, if the headach do arise from any affection of the mucous membrane lining the frontal sinus, that it is of a sympathetic kind, depending on the inflammation of the bronchia, which are lined by a continuous portion of the same membrane. The headach is no doubt increased by the congestion of the blood vessels of the lungs, which always takes place in inflammation of the bronchia when the cells are much loaded, because the blood is not properly purified, and therefore does not sufficiently stimulate the vessels. This necessarily interferes with the due return of blood from the head. The headach may be also increased by the circulation of this imperfectly purified blood through the vessels of the brain. The dependence of the headach on the state of the lungs is also shown by the relief that all those remedies afford to the pain which mitigate the pectoral symptoms.

The extreme debility which so suddenly occurs in the more acute bronchial inflammation, and puts an end to all hope of the patient's life, is often accompanied with a slightly livid colour of the skin, particularly of the lips. It is true that the pallidity of the countenance, which is so characteristic of bronchial inflammation, sometimes continues nearly to the last: but even in such cases the lips and tongue show the deficiency in the change of the blood by the livid tinge which may be discerned on them. This is easily accounted for, when we reflect on the state of the bronchial cells, and

consider the effect which must thereby be produced on the pulmonary and general circulation.

For, when the secretions begin to accumulate in the air cells, it is quite clear they must tend to prevent the decarbonisation of the blood, because that brought by the minute vessels to the bronchial surface cannot be properly acted upon by the air. As soon, therefore, as the secretions are redundant, the change from venous to arterial blood will probably be imperfect. This imperfection, in the first instance, is so trifling, that the quantity of venous blood circulating through the arteries must be very small. But if the inflammation continue, and the quantity of mucus increase, the blood is still less decarbonised, and at length becomes unfit to stimulate the nervous and sanguiferous systems to their healthy functions.

The blood vessels of the lungs must consequently become congested, and the blood necessarily accumulate on the right side of the heart and in the veins; and of course the blood thrown into the arteries must be less perfectly decarbonised. This fully explains the lividity of the lips, and the highly laborious breathing so generally observed to occur as the fatal termination approaches.

It is also manifest that the blood circulating in the brain is of such a nature as we know always debilitates that organ. Its functions, therefore, cannot be performed as in health, and the whole system must participate in its derangement. This

fully explains the sudden and fatal sinking so frequent in this disease.

From these circumstances too we are enabled to understand the difference in the character of the pulse, and other symptoms in some of the varieties of acute bronchitis. In the second, which comprehends the *peripneumonia notha* of Sydenham and others, we have inflammatory action of the mucous membrane of the lungs, combined with the effects of a relaxed habit and weakened organ, in consequence of which the inflammatory symptoms are often very slight, because the copious effusion either wholly removes the incipient inflammation, or prevents its becoming considerable.

In the third variety bronchitis generally occurs in the young and robust, and therefore at first produces the same disturbance in the circulating system as takes place in other highly inflammatory affections, because the secretions of the bronchia are not so soon redundant. But if the inflammation proceed, the secretions accumulate in those cases also, and a fatal collapse of all the powers of the system then invariably ensues.

The effects of inflammation in any part differ according to the constitution of the patient and according to the predisposition of the part. In people advanced in life the bronchia are often loaded with mucus, either from the increased secretion of the follicles or debility of the absorbents. There is also a tendency to serous effusion. In

them, therefore, inflammation of this membrane necessarily occasions a quicker accumulation of the exhaled fluids than in the strong and robust.

But besides these variations in the nature of the inflammatory action, which arise from the constitution of the individual and the predisposition of the mucous membrane, the facts already detailed relative to the connexion of bronchial inflammation with cutaneous diseases, seem to allow the conclusion that the nature of bronchial inflammation may vary as the cause varies from which it originates. Let, however, this question be determined as it may, the foregoing history of inflammation of the bronchia, as dependent on cutaneous diseases, points out the great importance of a more minute attention to the state of this membrane in affections of the skin. By a careful attention to those cases in which pulmonic affections are combined with or succeed to eruptions, pathology may be enriched with many valuable facts; and minute morbid dissection may show that the air passages are subject to diseases as numerous and as different in their characters as those which attack the skin. The appearances observed in all examples of this kind which have fallen under the author's observation are referred to inflammation, because they resemble those which result from inflammatory action in other parts. It is not, however, improbable, or rather it is extremely likely, that the kind of inflammation in the mucous membrane varies with the

nature of the cutaneous inflammation which precedes or accompanies it. In fact this is proved to be the case in measles; for the membrane is sometimes affected in patches nearly approaching to the figure of semicircles, in the same manner as the skin is in that disease. But it would be premature, in the present state of our knowledge, to attempt any arrangement of bronchial affections founded on a supposed diversity in the disease attacking this membrane. The facts, however, now brought forward, render it in some degree probable, that when morbid anatomy is further advanced, we may be enabled to describe several of these disorders, instead of indiscriminately referring them to inflammation. This, indeed, will require a degree of improvement in our means of discovering changes of structure which does not seem very near to us.

In the mean time, the difficulties which attend such investigations should rather increase than diminish our endeavours to overcome them; and every friend to our science will, in all cases, admit the necessity of recording the deviations from healthy structure which the bronchial membrane may present, and particularly in those which succeed to cutaneous diseases.

It is necessary also to consider the combination of bronchitis with diseases of the abdominal viscera. It has long been known that any thing which greatly deranges the stomach and bowels is capable of bringing on dyspnœa and cough, and that

a certain degree of irritation of those parts may cause all the symptoms of pneumonia. Worms have been often observed to produce these effects, the pulmonic symptoms being much relieved by their expulsion from the intestines. In these cases the pulmonic affection is probably sympathetic, and there is no actual disease of the lungs; but if the irritating cause, under such circumstances, continue to operate in the abdomen, disease takes place in the thoracic viscera. In like manner, when bronchitis is combined with a chronic disease of the liver, which irritates the mucous membrane of the lungs, it is probable that at first the bronchia are only sympathetically affected, but become afterwards inflamed. The hepatic disease may have no other connexion with bronchitis than that of rendering the membrane more disposed to inflammatory action, and then, from the common exciting causes, the inflammation more readily takes place. If this do occur, it is evident that when the inflammation of the bronchia comes on it will be very likely to be kept up by the disease in the liver.

Sometimes bronchitis appears to precede the inflammatory affection of the liver. This is not so common an event as the former; but it appears to arise from the mutual sympathy which takes place between the thoracic and abdominal viscera.

Acute hepatitis and bronchitis occasionally exist together, and we cannot determine which of them first made its appearance; but even then they seem

intimately connected; for any aggravation of the hepatic disease produces a corresponding effect on the inflammation of the bronchia.

This kind of combination is more frequently observed after measles than any other disease.

It is impossible to point out the precise nature of this relation between the viscera of the thorax and abdomen; but it is certain that diseases of the former are often combined with those of the latter, and that their diseases mutually influence each other. It appears also that disease is more frequently excited in the thoracic viscera by some abdominal affection than the abdominal affection by the thoracic disease, though the latter sometimes happens.

Diagnosis.

The discrimination of acute bronchitis from pneumonia is difficult, and these diseases cannot be always distinguished from each other. The countenance is frequently pallid in bronchitis; it is not so in pneumonia. The dyspnœa is more distressing in acute bronchitis than in inflammation of the lungs. There is also a greater degree of anxiety in the former than in the latter affection. Pain is seldom complained of in bronchitis, a diffused soreness of, or a peculiar straitness across the chest being alone felt; whilst pain almost constantly attends pneumonia. When the expectoration commences, it is much more copious in inflammation

of the bronchial membrane than in inflammation of the substance of the lungs or pleura. The wheezing noise which almost constantly attends some of the varieties of inflammation of the bronchia is seldom heard in that of the lungs. There is something also peculiar in the respiration in almost every instance of acute bronchitis; it is hurried and anxious; and, as Dr. Badham observes, the efforts of all the voluntary muscles that can be called into action render the oppressed state of the lungs sufficiently evident. The anxiety of countenance is much greater in bronchitis than in pneumonia. The pulse may also assist us in forming our diagnosis. Dr. Badham observes that the state of the pulse is certainly different in bronchial inflammation; it is frequent, but it wants the hardness and vibration of the pleuritic pulse. There seems to be something here in the nature of the part inflamed, which has an influence on the kind of pulse produced, as in enteritis and inflammation of the stomach: the arterial pulsations in these diseases, as all practical writers have noticed, differing much from those which attend the inflammations of the solid viscera.

We may likewise be aided in forming our diagnosis by attending to the origin of the disease. If the pectoral attack succeed to rubeola, it is more than probable that it is seated in the bronchial membrane. In the same manner, if difficulty of

breathing and cough come on immediately after the disappearance of any affection of the skin, there is good ground to suspect that the mucous membrane lining the air passages may be in a state of diseased action. In variola, when much difficulty of breathing occurs, it is probable that inflammation of the bronchial membrane may have taken place. In chronic ulceration of the trachea, when any sudden attacks of difficult breathing happen, and continue for some time, it is likely that the more minute air passages are inflamed.

In general bronchitis may be readily distinguished from croup. The unusual sound produced by the cough, and the peculiar noise which occurs in respiration, in the latter disease, are not heard in the former. There are cases, however, in which bronchitis is combined with inflammation of the trachea, and then symptoms somewhat similar to those which take place in croup occur.

In two cases seen by the author, in which severe pulmonic symptoms succeeded to rubeola, the cough, after the second day, was attended with a peculiar shrill sound, and the breathing became in some degree stridulous. There was not, however, much restlessness, and the symptoms were milder than in croup. They also continued much longer than they do in that disease. In one of them the stridulous respiration and shrill sound in coughing remained for nearly a fortnight, and at length terminated in perfect recovery. In the other the disease

proved fatal on the seventh day after the respiration had become stridulous. On dissection, the mucous membrane lining the glottis and the trachea was found inflamed, as was also that of the bronchia. The trachea, bronchia, and air cells, were filled with tenacious mucus, mixed with a puriform fluid; but none of the membranous concretion which is seen in croup was met with.

The various affections of the voice, breathing, and cough, which take place during the progress of croup, very well point out the different state of the symptoms, according as the one or the other part of the mucous membrane lining the respiratory organs is inflamed.

In the first stage, when with the croupy cough the breathing is difficult, the serious attack has commenced, and the child is in danger. In this state the child's skin is warm, his tongue is white, his pulse full and quick, and his countenance is much flushed; but it is still the flush of heat and fatigue. The usual mucous secretion is interrupted; he is timid and apprehensive, and, when advanced beyond infancy, he is willing to submit to any measures which may be thought necessary for his relief. His eye is heavy, watery, and bloodshot.

The second stage is that of effusion. The countenance is still flushed, but in the flushing we discover evidence of defective circulation. The lungs no longer purify the blood. There is a purple redness in the cheeks, eyes, and nails. The com-

plexion is often mottled, or leaden, or the flush on the cheeks is circumscribed. The pulse is smaller, and very quick. There is sometimes an expectoration of mucus mixed with flakes of puriform matter. There is a sediment in the urine. The eyes are prominent and bloodshot, the pupil is dilated. There is jactitation when the breathing is most violent, and lethargy when it is less so.

In the first stage, says Dr. Cheyne, the breathing is difficult; in the second, it is both difficult and laborious. In the first stage the difficulty of breathing appears chiefly to arise from the state of the windpipe; in the second as much, perhaps more, from a disease of the whole pulmonary system. There is both heaving of the diaphragm and abdominal muscles, and a remarkable pulling down of the cartilages of the larynx at each inspiration*.

In the same manner inflammation may commence in the bronchia, and produce the common symptoms of bronchitis; but it may extend during the progress of the disease to the windpipe, and then some of the symptoms which characterize croup will also show themselves.

There can be no doubt, that when inflammation comes on in one part of a membrane that lines different organs, it may spread to every part of that membrane; but the strongly marked features of the disease seem generally to proceed from the injury

* The Pathology of the Membrane of the Larynx and Bronchia. By J. Cheyne, M. D.

done to the part first affected, because there the inflammation is usually greatest. Thus, in the examples of bronchitis and croup above adduced, the inflammatory action commences in very different portions of the same membrane, and the one affection produces symptoms very unlike those brought on by the other, because the respiratory functions are variously disturbed, according as the one or the other of the organs subservient to breathing is affected. But when inflammations of the trachea and bronchia are combined, then the symptoms proper to each occur together, although the symptoms of the primary disease are in general most prominent.

Bronchitis may be known from chincough by the greater degree of fever attending the former. In many cases of the latter disease, the pyrexia is scarcely discernible. The dyspnœa, too, is much greater in the former than in the latter disease, excepting at the periods when the fits come on. The convulsive effort which uniformly attends the coughing, when the chincough is completely formed, affords a sufficient distinction from bronchitis: but this frequently does not occur early in the disease. In some cases, where it has obviously arisen from contagion, and has begun in the form of catarrh, it never takes on the peculiar character of whooping cough; for the difficulty of breathing, cough, and pyrexia, are so urgent as to prove speedily fatal. These cases do not differ

from bronchitis. Dissection shows the trachea and bronchia highly inflamed, and the latter and the air cells filled with a whitish pus-like fluid.

Chincough, indeed, seems generally to terminate in bronchitis before it proves fatal. A considerable dyspnœa, and quickness and hardness of the pulse, whenever occurring in the former disease, are strong indications of a high degree of inflammatory action in the mucous membrane of the lungs. In the cases related by Dr. Watt*, when the disease terminated fatally, the mucous membrane of the lungs always bore evident marks of extensive inflammation. In one of them, the anterior surface of the lungs appeared as if covered with whitish coloured flat tubercles, (not unlike bad confluent small-pox,) as if some white fluid had been effused under the covering pleura. On making some incisions into the substance of the lungs, the cells were found filled with a whitish purulent-looking mucus, with only a small admixture of air. The cells immediately under the investing pleura, thus filled, were the cause of the external appearance of the lungs above described. Some very small portions of the lungs appeared to have the cells less full of this mucus than the rest, the external surface of these portions having a more natural appearance.

* A Treatise on the History, Nature, and Treatment of Chincough. By R. Watt, M. D.

The posterior surface of the lungs had a brighter appearance than the anterior, having more the look of recent inflammation. The inside of the trachea, from the thyroid gland downwards to an inch below the bifurcation, had its inner surface smeared over with the same kind of mucus as that filling the cells of the lungs: beyond this its branches appeared completely filled with the same mucus.

The whole inside of the trachea and its ramifications were painted with red vessels, appearing to have been the seat of recent inflammation.

The following statement, for which the author is indebted to his friend, Dr. Malden, also points out how extensive the inflammation of the mucous membrane of the lungs becomes in chincough, when there has been much fever and dyspnœa previous to the fatal termination.

Three children, in the year 1817, contracted whooping cough, which was then epidemic. The season being very cold, they were kept in apartments the temperature of which was regulated; their bowels were attended to, and occasional doses of ipecacuanha were administered, by which all their symptoms were much relieved. On the whole, they may be said to have had the disease mildly, and about the sixth week were convalescent, the cough returning only at long intervals, and their general health and spirits being very good.

At this period, while a very piercing north-east

wind prevailed, they were unfortunately taken out in the middle of the day. In the evening their paroxysms of cough returned frequently, and more violently than even at the height of the disease. The next day all the symptoms were much aggravated. Great dyspnœa had supervened. They had frequent desire to go to stool, but voided only mucus, which, in the eldest, was slightly streaked with blood. Their countenances were much flushed; and the eldest complained of great pain in the head, much increased by the paroxysms of cough.

Local blood-letting, blistering, the warm bath; magnesia, combined with ipecacuanha, with the addition of a small quantity of lemon juice, was administered, which, in the eldest, was soon followed by a natural stool, and she eventually recovered. The two youngest died, apparently from suffocation, on the fourth day after their exposure to cold. The cough retained its peculiar spasmodic character to the last.

On examining the bodies about twelve hours after death, the trachea and bronchia, as far as they could be traced, were found highly inflamed, and loaded with a frothy mucus; but what is, I believe, an unusual appearance, in both these cases the pharynx and œsophagus showed signs of inflammation; and on examining the villous coat of the stomach and intestines, the marks of inflammation were most unequivocal and extensive, the

whole tract of the alimentary canal exhibiting a bloodshot appearance, which increased to a dark purple in the large intestines. They contained an unusual quantity of thick mucus, which, in the elder of the two, was stained with bile, but in the younger was of a whitish colour.

Whatever might have been the state of the mucous membrane of the lungs at an early period of these cases, it is quite evident that the severer symptoms, late in the disease, were attributable to inflammation of that part.

Dr. Watt remarks, "that from the state of the pulse, and the state of the breathing, we can draw more certain conclusions as to the nature and severity of the disease, than from any other circumstance whatever. I have never met with almost any case where either the one or the other was much affected, where there was not very considerable danger; and none where the two symptoms were conjoined, that did not prove fatal, unless opposed by the most vigorous treatment."

The proximate cause of chincough still remains in doubt; but, from the facts we at present possess, it would appear, that the whole of the danger attending this disease arises from the symptoms which are produced by an inflammatory affection of the respiratory organs. From this circumstance, it is, perhaps, impossible to point out the precise symptoms which will enable us to distin-

guish bronchitis from chincough ; but it is probable that all the dangerous symptoms attending the latter disease may generally be attributed to inflammation of the mucous membrane of the lungs.

It is scarcely necessary to say, that bronchitis may be distinguished from acute asthma by the degree of cough, which, in the former, is generally urgent, whereas in the latter it is very slight. The dyspnœa is uniformly severe in bronchitis, whereas in asthma it is sometimes relieved by a disengagement of flatus. In the former disease there is pyrexia, and the urine is high coloured.

Prognosis.

The danger from acute bronchitis is very different in the several varieties ; but it is true of all, that when the breathing is not very difficult, the cough not severe, the expectoration copious and free, and affording relief, the pulse regular and firm, and not very frequent or hard, and the strength not much reduced, the prognosis is not unfavourable.

When the breathing is very high and laborious, a degree of coma supervenes, the nails become livid, and the voice is hoarse and indistinct : when the anxiety and sense of oppression are very great, and the pulse weak, quick, and fluttering, the fatal event will almost inevitably occur.

There are few diseases, however, in which the

prognosis is more uncertain than in the second variety of bronchitis. The symptoms are, perhaps, at first very moderate, or even slight; but after a few days, an unexpected exacerbation takes place, and puts an end to the patient's life, when the indications of danger were before very little evident; or when, if the symptoms have been at first severe, a considerable abatement of them has afforded hopes of recovery. There is no symptom on which more dependence can be placed than on the state of the expectoration. Whenever the disease terminates favourably, the expectoration is much more free and copious than in pneumonia; and in proportion as the danger increases, the lungs become more oppressed, the expectoration less free and copious, and the debility greater.

But even when the event is propitious, if its ultimate results be considered, this must be regarded as a disease of a dangerous character. The mucous membrane having been once attacked, at the period of life in which this variety usually occurs, becomes particularly susceptible of similar seizures, and a chronic disease may be thus established, which gradually undermining the constitution, may lay the foundation of hydrothorax. The disease also sometimes degenerates into a spurious consumption, which in many instances proves fatal; and after death the mucous membrane of the bronchia is often found ulcerated.

In the third variety, when bronchitis attacks the

strong and plethoric, the danger is seldom equivocal. No inflammatory affection of the pulmonary organs is more frequently fatal than this. There is much to dread, even if vigorous measures be employed at an early period. The sense of constriction across the chest; the hurried, anxious, and laborious breathing; the cough without much expectoration, the dry and hot skin, the foul tongue, the high coloured urine, and the quick pulse, indicate severe inflammation of the mucous membrane.

The prognosis is more favourable if the breathing be relieved, and the cough be attended with a free expectoration. But it is much worse if we observe the slightest purple tinge on the cheeks, or if the expectoration diminish, and the breathing become more difficult; or, finally, if the eyes be rather prominent, and the patient alternately restless and lethargic.

The case is altogether hopeless when the pulse becomes quite feeble and frequent; or when partial sweats break out, and the expectoration ceases.

In young children, the prognosis is more unfavourable than at any other age.

Bronchitis arising from cutaneous diseases is more dangerous than that proceeding from cold.

Of the Treatment of Acute Bronchitis.

From the preceding history of this disease, it appears that a variety of causes may give rise to

bronchitis. The treatment will be also found to vary, in some particulars, with the cause. But the causes being all such as bring on inflammation of the mucous membrane of the lungs, the fundamental indication is to remove the inflammatory action, so as to prevent those changes which will otherwise occur in the structure of this delicate membrane.

The following is a concise view of the means we have recourse to for removing these inflammatory affections. To moderate the excitement of the sanguiferous system — general blood-letting, acidulated and mucilaginous drinks, and abstinence from all stimulating food. To promote expectoration and perspiration — antimonial and saline medicines. To direct the fluids towards the surface, and relieve the congestion of the debilitated capillaries — local blood-letting, blisters, and rubefacients.

The above means are general and local. Of those which are general, blood-letting is by far the most powerful for diminishing the excitement of the system; but it is not equally called for in all the varieties of bronchitis.

It is seldom necessary to detract blood in the first variety; yet if the fever be considerable, and the breathing much affected, blood-letting may be employed with the greatest advantage.

In the second variety, where the disease occurs in phlegmatic habits, venesection is generally proper, but, on account of the peculiar habit of

body, blood-letting should be employed with caution ; for Sydenham observes, (and all succeeding writers have admitted the accuracy of his observation,) that patients of this description do not bear bleeding well. The abstraction of ten ounces of blood from the arm early in the disease, sometimes mitigates the symptoms, after which it is generally more safe to depend upon an attention to diet, proper expectorants, and local evacuations. The peculiar tendency to effusion often renders the treatment of this affection difficult, as we are sometimes deterred by this cause from pursuing the blood-letting when the inflammatory symptoms indicate its employment. In this event we must subdue the inflammation by those means which are least likely to bring on effusion.

Bronchitis, however, as has been noticed in the history of the third variety, sometimes occurs in robust habits, and occasions violent symptoms. The stage of excitement in these cases is not of very long continuance ; it soon terminates in irremediable debility. The short space of time that is allotted for the employment of antiphlogistic measures should not, therefore, be allowed to pass without an attempt to make a decided impression on the disease. With this view, blood-letting should be boldly employed. From twenty to thirty ounces of blood may be taken from the arm in severe cases, at the first blood-letting. It is difficult, however, to direct the precise quantity of blood. If

the patient be of a strong habit, and the pulmonary symptoms urgent, and the febrile excitement considerable, we should allow it to flow till the pulse becomes weak, or the pulmonary symptoms are relieved. There are few cases which yield to one blood-letting. The propriety of its repetition should be determined by the degree of benefit obtained, the state of the symptoms, and the strength of the patient. Several blood-lettings are sometimes required.

When the disease attacks children, general blood-letting should be employed as far as the strength will admit. In young children we cannot always obtain blood from the arm, but we may generally succeed in taking it from the jugular vein. This practice, indeed, is attended with some advantage, as the blood is taken from a vessel which pours its contents into the thorax. Cases of this description have occurred to the author, in children of about four years of age, in whom dyspnœa, threatening speedy suffocation, was completely removed by the detraction of six ounces of blood from the external jugular.

It is true that, for the most part, children do not bear the loss of blood well; but in an attack which is menacing life there is no alternative: we must adopt powerful measures, for without them the disease will almost certainly prove fatal; but such is its dangerous character, that even by them its progress is often not arrested.

In the combination of abdominal disease and bronchitis, the degree of debility, if the former have existed any length of time, is sometimes such as not to admit of a great loss of blood; but if the abdominal and pectoral inflammations are simultaneous effects, blood-letting should be as freely employed as in the third variety.

When bronchitis is complicated with chronic disease of the trachea, blood-letting to any great extent cannot be always employed; for if ulceration of the trachea have come on, the strength is often so much exhausted by it, that the loss of any considerable quantity of blood is not admissible. Even if relief be obtained by these means, it can only be temporary, unless the ulceration can be removed.

Bronchitis arising from the irritation of external tumours requires venesection; but this remedy cannot give effectual relief, unless the cause producing the inflammation can be taken away.

Vomiting is sometimes productive of relief. Several writers have spoken very highly of the use of emetics in the second variety. We have seen that Lieutaud and Cullen think that full vomiting often brings immediate relief, and that nauseating doses of emetics ought to be constantly employed. The benefits which arise from emetics are twofold: they unload the *primæ viæ*, thus removing causes of irritation; and they increase the expectoration,

on which, as is above observed, the favourable issue of the case so much depends.

Again, when the disease occurs in young children, emetics appear to be extremely serviceable, the stomach and bowels being generally in a bad state, and the bronchia loaded with redundant secretion.

In each of the above states, the vomiting, if necessary, may be repeated, and in some cases a frequent repetition of emetics is called for. The aqueous solution of tartarized antimony is in general, perhaps, the best remedy for producing these effects, although in young children it is not so safe as ipecacuanha, which, in them, should be consequently preferred. Independently of the action of the former as an emetic, it seldom fails to excite diaphoresis, which, if general, and not too profuse, nor brought out by heating measures, is usually beneficial. But the good effects of antimonials are not confined to those states in which we wish to produce vomiting. In every variety of acute bronchitis, when there is much fever present, the greatest advantage is derived from the steady use of antimonials. They are indeed the most valuable of all medicines, for they not only, by exciting nausea and opening the pores of the skin, considerably lessen the febrile excitement, but, by their action on the exhalant vessels of the lungs, they promote expectoration, and thus lessen the inflammation of the mucous membrane. They may be

given in combination with saline draughts and nitrate of potass, which should be always employed when there is much fever.

The advantages derived from a free expectoration have led some to recommend various expectorants. In the second variety of this disease the more stimulating have even been advised, and from the peculiar habit of body, they may be sometimes admissible; but they cannot be proper if the heat be much increased. In the advanced stage, however, when the inflammation is nearly subdued, and the bronchia are clogged, ipecacuanha combined with squills is often of great service; but in all cases of this disease, as long as the excitement is considerable, if antimonial remedies be excepted, no expectorants are so useful as mucilaginous mixtures. Watery vapour also, alone, or impregnated with various substances, has been inhaled, with the view of promoting expectoration; but its beneficial effects, if any, appear to be very limited.

Cathartics are not considered so effectual in removing inflammatory diseases of the thoracic as of other viscera. Sydenham, however, assures us, that they may be freely employed with advantage in peripneumonia notha. Many also since his time have thought that the objection against them is not valid in this variety of bronchitis; and of late, since the attention of medical men has been so much called to purgative medicines, that they

are freely used in almost all diseases, they are more commonly exhibited than formerly in all pulmonic affections.

In every variety of bronchitis, therefore, we should keep the body lax; and in the commencement of the disease, should administer an active purgative, so as to clear the alimentary canal, and should afterwards so employ it as to keep up a due action of the bowels.

There is one variety, the combination of bronchitis and abdominal disease, in which the free employment of cathartics is of the utmost importance. When there is an evident hepatic affection, and the stomach and bowels are loaded with unhealthy bile, we must always have recourse to cooling and mercurial purgatives. From small doses of the neutral salts, given so as to keep up a constant catharsis, the greatest benefits ensue.

Mercurials, exhibited so as to act upon the system, are not usually beneficial; nevertheless, when in the sixth variety the liver is evidently affected, small doses of blue pill may be given, so that the gums may become tender.

When also bronchitis is combined with inflammation of the trachea, and produces symptoms resembling croup, analogy would lead us to employ calomel in frequently repeated doses. In the fourteenth case, where bronchitis occurred in conjunction with chronic inflammation of the mucous membrane of the trachea, great advantage arose

from its exhibition. The voice had become very indistinct, and the quantity of sputa was considerable. The patient took eight grains of calomel every day for several weeks, and eventually recovered.

Opium is prejudicial as long as there is much fever; but when that declines, and irritability of the system and air passages still prevails, it not unfrequently allays the cough, and calms the patient: but opiates must be employed with great caution, especially in the second variety; for when the secretion is copious, and the strength much reduced, they interrupt, for a time, the efforts to expectorate, and may thus prove fatal.

In combination with small doses of calomel, opium may sometimes be exhibited at an earlier period of the disease. When conjoined, these remedies not only diminish the cough and assist expectoration, but seem likewise to regulate the secretions throughout the system.

Diuretics, in the second variety, have been advised by some writers of authority; and when the disposition to effusion shows itself, the milder kinds may be of considerable service.

All the varieties of acute bronchitis may terminate in a state of collapse of all the powers of the system, if the remedies employed do not check the progress of the disease. In that event we must support the strength of the patient, and endeavour to relieve the bronchia of the secretions with which

they are clogged. Ammonia, whose stimulating powers are least to be dreaded, seems best calculated to produce these effects, as it is sometimes serviceable in promoting expectoration towards the decline of the disease; but if a certain degree of collapse have come on, all attempts of the physician to relieve the patient are unavailing.

The local means of most importance in acute bronchitis are topical blood-letting and blisters.

It appears, from what has been said of the nature of inflammation, that different effects are produced by general and local blood-letting: the former diminishes the excitement of the heart and larger arteries; the latter relieves the weakened and dilated capillaries. Hence much advantage is derived from combining the two modes of blood-letting, as we thus relieve the patient more speedily, and without so great a loss of blood. Whenever, therefore, in bronchitis the symptoms require general blood-letting to be repeated, we should also have recourse to local evacuation. The blood should be taken away from the neighbourhood of the inflamed part, by leeches, or the scarificator and cupping glasses.

Sometimes, after the increased action of the heart and larger arteries has been diminished by venesection, local blood-letting is sufficient to remove the disease. In the second variety, as above observed, although the symptoms seem to require its employment, we often dread the effects

of general blood-letting: in such cases local bleeding should be assiduously used.

When the symptoms are not urgent in some of the varieties of bronchitis, as in the attack which follows measles, we may sometimes attempt the cure by local blood-letting; but when this fails to produce speedy and effectual relief, venesection should be no longer delayed.

Blisters are productive of great benefit, but they should not be applied till the excitement has been considerably relieved by blood-letting. The period, therefore, proper for their application, must vary according to the nature of the constitution, the urgency of the symptoms, and the effects of other remedies. When bronchitis occurs in phlegmatic habits, and assumes the form of peripneumonia notha, blistering may be employed from the commencement, and is one of the remedies to be chiefly relied on in the cure of that variety. If the disease be obstinate, we should not be content with a small blister to the chest; one of sufficient size to cover the whole of its anterior part should be applied; and if the symptoms do not readily yield, the discharge from the blistered part should be supported, or a succession of blisters employed.

The tepid bath often relieves this as well as other internal inflammations, by removing the tension of the surface, and exciting diaphoresis. Local fomentations and cataplasms may be also used: they bring a larger quantity of blood into the vessels of the integuments covering the thorax,

and encourage a more copious effusion of blood from the leech bites.

Occasionally the disease becomes chronic. In this event, those remedies are to be had recourse to which we shall mention when treating of chronic bronchitis.

This disease is almost invariably followed by great debility, both of the general and of the pulmonary system. For its removal nothing is more appropriate than a light and nourishing diet, with change of air. Tonics may also be given; but their powers are exceedingly limited, and we should be careful not to exhibit them too early, nor to direct such as are very stimulating.

It appears from the account now given of the remedies proper for this disease, that they correspond with the principles before laid down relative to the general nature of inflammation. The means employed, with the exception of expectorants and mucilaginous drinks, are either calculated to regulate the vis à tergo, or to relieve the local congestion.

CASE I.

Bronchitis from Cold in an old Man, terminating fatally on the eighth day.

On the 24th of October, J. K., aged fifty, was received into the Worcester Infirmary. Five days before he was admitted he had been exposed to

cold. This brought on chilliness, which was followed by heat, thirst, and restlessness. A cough, with a sense of constriction across the chest, came on directly afterwards. When he applied for relief, the cough was attended with intense headach. He made a wheezing noise in breathing; complained of a distressing constriction across the thorax; and expectorated some dense mucus, which did not afford any relief. Pulse 100. Tongue dry.

Ten ounces of blood were taken from the arm, and a blister was applied to the chest. On the 25th, the breathing was relieved, and the cough was not so urgent. On the 26th, the symptoms returned with greater violence: the breathing became so high and laborious that he could not assume the horizontal posture: the lips were livid; and the expectoration had ceased. Early on the morning of the 26th he died.

Dissection.

The lungs did not collapse when the thorax was opened. Their blood vessels were very much loaded with blood; but neither the substance of the lungs nor the pleura was inflamed. When an incision was made into the substance of the lungs, a quantity of bloody fluid mixed with air escaped from the air cells. The mucous membrane of the trachea and bronchia was inflamed, and the air passages were quite filled with a bloody fluid, mixed with tenacious mucus. In one or two parts,

a small quantity of pus was to be seen. The auricles of the heart were more distended with blood than natural; but in other respects that organ was healthy.

The liver was of a lighter colour and harder than natural, but that organ did not bear any marks of recent inflammation. The other abdominal viscera were healthy.

Observations.

The insidious nature of this case, and the slow progress of the symptoms, correspond with the history of peripneumonia notha, as detailed by Sydenham and Cullen. It certainly at first appeared no other than a catarrhal affection in an elderly person, attended with a large afflux of mucus to the lungs. After a day or two these symptoms suddenly became considerable, and speedily put an end to the patient's life. The examination after death proved that the mucous membrane was much inflamed, and that a very copious secretion had taken place from it, which had obstructed the air cells, and opposed an obstacle to the decarbonisation of the blood. The transmission of the blood through the lungs was thus prevented, the vessels of that organ became much loaded, and the cavities on the right side of the heart very much distended.

The chronic disease of the liver, by the irritation it excited, probably predisposed the mucous mem-

brane to inflammatory action, but could not have had any other share in producing the patient's death.

CASE II.

Bronchitis in a young Subject terminating fatally on the fourth day.

J. G., aged thirty, was admitted an in-patient of the Worcester Infirmary on the 20th Jan. 1813. He was affected with cough and great difficulty of breathing. He could not lie down in bed, and did not expectorate. The lips and face were of a livid hue. He took a deep inspiration without pain, but complained of great tightness across the chest. Pulse small, weak, and contracted. Tongue clean. Bowels regular.

His complaints began three days before admission, after exposure to cold.

Twenty ounces of blood were taken from the arm, and a blister was applied over the whole of the chest, but he was not at all relieved. He died the following morning.

Dissection.

The lungs did not collapse when the thorax was opened. There was no appearance of inflammation of the pleura. The substance of the lungs did not seem at all inflamed. The mucous membrane of the bronchia was minutely injected, and the air cells were full of tenacious mucus mixed with pus.

The larger blood vessels of the lungs were very much loaded with blood.

The heart was healthy, excepting that the cavities on its right side were enlarged.

There was no disease of the abdominal viscera.

Observations.

The urgency of the pectoral symptoms, the rapidity of their progress, and the absence of pain in the chest, form the most striking features of this case. The lividity of the countenance points out the great obstruction which existed to the chemical changes which naturally take place in the blood. The dissection, by bringing to light the highly inflamed state of the mucous membrane of the lungs, sufficiently explained this symptom, and accounted for the great degree of dyspnœa which accompanied the disease.

CASE III.

Bronchitis from Cold terminating fatally in two days.

On the 26th of March, 1820, J. M., aged forty-five, stout and plethoric, and addicted to drinking spirits, was exposed to cold, which on the 27th induced the symptoms of a severe catarrh. On the 28th he was seen by my friend Mr. Pierpoint, who ordered him a cathartic and antimonial medicines, and a blister to the chest. He improved

very much under these remedies, and was so well on the 31st as to return to his occupation. In the evening of that day he imprudently went out into the cold when under the operation of a cathartic. During that night he was seized with delirium, great difficulty of breathing, and cough.

At one o'clock, on the 1st of April, Mr. Pierpoint requested me to visit the patient with him. We found the breathing very high and laborious, slightly shrill, and wheezing. The patient was very hoarse, but had not much cough, nor any expectoration. He took a deep inspiration without pain. The countenance was anxious, and he talked incoherently. The pulse was 120, unequal in its beat, and fluttering. The tongue was loaded. The surface hot. The face flushed. The bowels regular.

Sixteen ounces of blood were taken from the arm, which produced complete syncope. He was directed two grains of calomel and three of antimonial powder every four hours.

At six o'clock we again visited him. The breathing was easier. The pulse was more steady, and the countenance not so anxious. The blood which had been drawn at our first visit was much buffed and cupped, and the crassamentum was very firm. The skin was still hot.

Twenty ounces of blood were taken from the arm, which again brought on syncope. Soon afterwards twenty leeches were applied to the upper

part of the sternum, and he continued the calomel and antimonial powder.

The breathing during the night became worse, cold perspirations broke out, and he died early the following morning.

Dissection.

The lungs did not collapse when the thorax was opened. An incision was made into the trachea. There was not much frothy fluid contained in it, but the mucous membrane was found rather redder than natural.

Immediately below the bifurcation of the trachea the membrane lining its ramifications was found pulpy, and minutely injected with blood of a deep red colour. On pursuing the ramifications of the bronchia, the membrane lining them was every where found of a deep red colour, and the cells were filled with a frothy fluid. There was no inflammation in the substance of the right lung, but that of the left was rather more solid than natural, and in the bronchia of that lung some purulent matter was mixed with a frothy serum.

When an incision was made into the left lung, a frothy bloody serum, mixed with pus, escaped from its cells; but when a similar one was made into the right lung, a frothy serum, mixed with air alone, appeared. A small part of the pleura of the left lung was inflamed. There was also some old

adhesion between the pleura of that side and the pericardium. The pleura covering the right lung was not at all inflamed. There was no fluid in the sacs of the pleura.

The heart was healthy. Its cavities were nearly empty.

The abdominal viscera were not at all diseased.

Observations.

The most striking circumstances in this case are the extraordinary rapidity of its course after the relapse occurred, and the absence of pain in the chest. Throughout the four first days of his illness he had no symptoms indicating much inflammation of the pulmonic system, and on the fifth he was convalescent. But a second exposure to cold, two days before death, brought on an unusually violent pectoral attack. The circulating system was at the same time very much depressed, and seemed to forbid the free use of the lancet. A slight reaction, however, took place after the first blood-letting, which induced us to repeat that evacuation; but it was not followed by any good result.

From the appearances on dissection it is probable that inflammation of the mucous membrane commenced when the catarrhal symptoms appeared; which would soon have terminated in resolution, had not the exciting cause been again applied so as to produce an unusually acute inflammation of the

bronchial membrane, which by effusion proved speedily fatal.

CASE IV.

Bronchitis in a Child terminating fatally on the fourth day.

On the 20th of February, 1820, I. G., aged six months, was seen by the author. The child had taken cold two days before, and was in consequence affected with some degree of dyspnœa, sneezing, and cough. A wheezing noise was also heard in respiration. The face was very pallid. The skin hot. The pulse quick and rather hard. The bowels regular.

Three leeches were applied to the chest, and an ipecacuanha emetic was exhibited; the latter was directed to be repeated in the evening if the breathing were not relieved.

On the following day the child was worse. It was in general lying quiet and almost comatose, and the breathing appeared but little disturbed; but at intervals paroxysms of difficult breathing occurred, which were accompanied by extreme restlessness. There was a slight cough. The pulse was very rapid. The bowels were regular. The child did not refuse the breast.

Half a grain of calomel was directed to be taken every four hours. The leeches were repeated, and a blister was applied to the chest.

On the 22d the lips were slightly tinged with purple. The eyes were glassy. The breathing, excepting by paroxysms which were convulsive, appeared easy. There was no cough. The pulse was very rapid.

During the following night the child died.

Dissection.

The lungs collapsed partially when the thorax was opened. The pleura was not inflamed. The structure of the lungs appeared quite healthy. When an incision was made into the trachea, a quantity of purulent matter gushed out, and its mucous membrane was redder than natural.

On pursuing the ramifications of the bronchia, it was found that the mucous membrane of the lungs was of a deep scarlet colour, and that the cells were filled with purulent matter mixed with air. The mucous membrane of the right lung was more vascular than that of the left, and there was a greater quantity of purulent matter contained in the cells of the right than in those of the left lung.

The right auricle and ventricle were much loaded with blood, but the heart was free from disease.

The abdominal viscera were quite healthy.

Observations.

The symptoms produced by this violent inflammatory action of the mucous membrane were at first so slight as scarcely to cause any alarm; and

even to the last there were intervals in which the breathing was so little affected, that any one seeing the case at those intervals only, might not have considered that there was any danger; but when the paroxysms of difficult breathing came on, they often appeared to threaten speedy suffocation. The large quantity of purulent matter found in the bronchia and air cells is remarkable, and exemplifies, in a striking manner, the rapidity with which their mucous membrane under some circumstances secretes pus.

CASE V.

Bronchitis combined with Erysipelas terminating fatally.

On the 4th of October, 1819, J. H., aged nine, was received into the Worcester Infirmary for a scrofulous disease of the right ankle. Erysipelas was at that time prevalent in the wards. In a week after admission he had a shivering succeeded by heat, and soon afterwards an erysipelatous inflammation appeared on the right leg. In two days afterwards the erysipelatous inflammation on the leg appeared subsiding, but during the night following he was attacked with severe dyspnœa, and a distressing sense of constriction across the chest. The countenance was exceedingly anxious, and he had frequent cough, which was not attended with any expectoration. The pulse was small and

quick, the tongue brown and dry, and the thirst urgent.

Six ounces of blood were taken from the arm without any relief. The breathing became more difficult, and the lips livid.

He died the following morning.

Dissection.

The mucous membrane lining the bronchia and air cells was found very much inflamed. The tubes were filled with frothy serum, which in some places was mixed with a substance very like pus. There were several small tubercles in the structure of the lungs, but none of them appeared inflamed.

There were elongated adhesions between the pleura pulmonalis and costalis.

The abdominal viscera were healthy.

Observations.

The severe pulmonic symptoms which came on when the erysipelatous inflammation of the leg began to decline, evidently arose from inflammatory action taking place in the bronchial membrane. This inflammatory action was probably of the same nature as that which affected the leg, though it is not, perhaps, possible to point out the difference between the effects produced on the mucous membrane of the lungs by phlegmonous and erysipelatous inflammation. Whatever its nature might be, it proved speedily fatal, by causing so copious a

secretion into the bronchia and air cells that they were completely plugged up.

CASE VI.

Bronchitis combined with Erysipelas of the Leg terminating fatally in two days.

J. L., aged sixty, who had been for some time a patient in the Worcester Infirmary for vertigo and cephalalgia, and was very much debilitated, on the 4th of June, 1815, complained of shivering, which was followed by heat, and pain in the head, back, and limbs. On the following day erysipelatous inflammation appeared on one of the legs. He took an emetic and a cathartic. Under this plan the disease proceeded without any unfavourable symptom for two days. He was then seized with vomiting, pain and tenderness over the abdomen on pressure, and was also affected with great difficulty of breathing and cough, without any expectoration. Pulse 100, small. Tongue dry and brown. Bowels regular.

He was bled from the arm, and leeches were applied to the abdomen; but no relief of the dyspnœa, cough, or vomiting, ensued. The pectoral symptoms became hourly more oppressive, and he died the following day.

Dissection.

A considerable quantity of fibrine and serum was found in the cavity of the abdomen. The intestines

were generally glued together, and the peritonæum was highly vascular.

When the thorax was opened the lungs did not collapse. The pleura was not inflamed. The mucous membrane lining the trachea, bronchia, and air cells, was highly vascular, and the tubes were filled with bloody serum. The right auricle and ventricle contained more blood than natural.

Observations.

The great degree of debility which had been produced by the chronic disease previous to the attack of erysipelas, did not admit of a very liberal use of the lancet when the symptoms of internal inflammation appeared. The blood-letting did not appear to check the progress of this acute disease.

The erysipelatous inflammation in this case first attacked one of the extremities, but in a few days afterwards symptoms arose denoting an inflammatory affection of the viscera of the abdomen and thorax. Dissection brought to light inflammation of the serous membrane covering the viscera of the abdomen, and of the mucous membrane lining the air passages. The bronchial inflammation appears to have proved fatal by preventing the action of the air upon the blood. The blood vessels of the lungs became overloaded, the cavities on the right side of the heart distended, and suffocation finally ensued.

CASE VII.

Bronchitis, accompanying Rubeola, degenerating into a chronic Affection, and at length terminating favourably.

J. G., aged twelve, was attacked with measles on the 10th of March, 1819. The eruption was elevated and confluent, and she had a very bad cough from its first appearance. On the third day of the eruption the breathing was exceedingly laborious, and the cough very distressing. The pulse was 110, and hard, the heat of surface considerable, and the tongue much loaded. Blood-letting from the arm in the morning, to the extent of ten ounces, relieved these symptoms; but as the dyspnœa in the evening again became distressing, eight ounces of blood were then also drawn. She was directed to take one eighth of a grain of tartarized antimony, with one drachm of sulphate of magnesia, every four hours. On the following morning (the 27th) she was evidently better, but in the evening the cough and dyspnœa, with a sense of straitness across the chest, returned to such a degree as to call for a third blood-letting. By these means the difficulty of breathing and the cough were relieved, and she began to expectorate a thick mucus. But although the force of the disease was broken, it was not subdued. She had still considerable dyspnœa. The cough continued,

and was accompanied with a copious expectoration, which had a purulent appearance, and when viewed through two pieces of glass, various colours presented themselves. The face was flushed in an evening, and towards morning partial perspirations broke out. The emaciation and debility were considerable. She continued to expectorate copiously, and to be much troubled with the cough for two months, during which period she gradually lost flesh.

Throughout the whole of that time the bowels were kept open by a solution of Epsom salts taken early in a morning. Small blisters were frequently applied to the chest, and three grains of extract of hemlock were taken three times a day. She was confined to a milk diet.

During the month of June she improved very fast. The cough and the expectoration gradually diminished, and the strength returned. By the end of August she was so well as to resume her employment.

Observations.

The occurrence of the pulmonic symptoms in this case during the eruption of measles and the absence of pain in the chest, together with the violence of the dyspnœa, seemed to point out that the mucous membrane of the bronchia was the seat of the disease. For this reason, when at a more advanced period of the case phthisis appeared

to have come on, a more favourable prognosis was formed than the state of the symptoms would otherwise have admitted. It was still probable that the inflammation was confined to the mucous membrane of the lungs, and that this caused the copious purulent expectoration. The event seemed to justify this opinion; for by repeated blistering and the exhibition of extract of hemlock when the warm weather in the months of June and July set in, she completely recovered.

CASE VIII.

Bronchitis succeeding to Measles, and terminating fatally.

On the 20th of April, 1819, the author was requested to visit J. G., a delicate girl of three years of age, who had gone through the eruption of measles without any alarm to her parents. The breathing was very high and laborious. Violent fits of coughing occasionally came on, which were sometimes attended with a slight mucous expectoration. Pulse 100, hard. Tongue loaded. Bowels regular. Surface hot.

Two ounces of blood were taken from the arm, two leeches applied to the chest, and an antimonial emetic was exhibited.

These means did not produce any abatement of the symptoms. The dyspnœa indeed became much worse, a wheezing noise was heard in respiration,

the expectoration ceased, and the face became purple.

The child died the following morning.

Dissection.

The lungs did not collapse when the thorax was opened. The pleura was not inflamed, nor was there any abscess in the substance of the lungs; but when an incision was made into them a frothy matter escaped. When the trachea was cut into, it was found full of mucus mixed with bloody serum, and the bronchia and air cells were stuffed with the same kind of matter. The mucous membrane lining the trachea, bronchia, and air cells, was highly inflamed. The blood vessels of the lungs were much loaded with blood.

The right auricle and ventricle of the heart were distended, and contained a greater quantity of blood than natural.

The abdominal viscera were healthy.

Observations.

In this case the severe pectoral symptoms did not come on till after the subsidence of the eruption; at which period inflammatory action appeared to commence in the mucous membrane of the lungs. A copious secretion soon took place into the bronchia, which of course prevented the action of the air upon the blood, and thus offered an impediment to its free transmission through the lungs. It con-

sequently accumulated on the right side of the heart. Hence the countenance became livid, and suffocation speedily ensued.

CASE IX.

Bronchitis, combined with Hepatitis, succeeding to Measles, and terminating fatally.

On the 10th of May, 1819, the author was requested to visit H. L., a girl of six years of age, in whom the eruption of measles was disappearing. She had been twice bled during the eruption in consequence of the alarming nature of the pectoral symptoms.

The difficulty of breathing was great, and the cough was very troublesome. She also complained of pain in the right hypochondrium, and there was considerable tenderness of that part on pressure. The pulse was hard and quick, and the tongue white. The stools were dark coloured.

She was bled from the arm, and four leeches were applied to the right side. Two grains of calomel were also exhibited every three hours. These remedies were of no avail. She died on the evening of the 11th.

Dissection.

The pleura was not inflamed. The lungs did not collapse when the thorax was opened. There was no abscess of the lungs.

The mucous membrane lining the bronchia was evidently affected in the same manner as the skin had been during the eruption. It was red in patches, which assumed an irregular semicircular form: these patches in some parts ran into each other. The bronchia and air cells were full of pus and mucus.

The cavities of the right side of the heart were much loaded with blood. In other respects that organ was healthy.

The peritonæal covering of the liver was inflamed, and the blood vessels of that organ were much loaded. The other abdominal viscera were healthy.

Observations.

In this case the dissection proved that the peculiar eruption of measles had attacked the mucous membrane of the lungs. This accounts for the urgency of the pectoral symptoms throughout the whole of the eruptive stage of the disease. The affection was much aggravated, and the fatal event doubtless accelerated, by the combination of hepatic inflammation with this affection of the mucous membrane of the lungs. This combination of abdominal and pectoral inflammation very frequently occurs in the attack, which so often succeeds the eruption of measles. It was the suspicion of the existence of hepatic affection which induced

the author to prescribe calomel; for in all such cases it seems in vain to use general and local blood-letting without we also elicit a more healthy flow of bile by the action of mercurials.

CASE X.

Variola proving fatal on the fourth day of the Eruption. The Bronchial Membrane after Death was found inflamed.

W. D., aged three years, who had been exposed to the contagion of small-pox, was very feverish on the 14th of November, 1819. On the 17th red pimples appeared on several parts of the body. Their number was greatly increased on the 18th, and he was more feverish. He was kept cool and freely purged. On the 19th he was very hot and restless. The pimples had not increased much in size, but they were more numerous. There was some difficulty of breathing, which seemed to arise from phlegm in the throat. The bowels were constipated.

He was directed to take an emetic of ipecacuanha, and three grains of calomel and three of rhubarb every four hours, till the bowels were freely moved.

On the 20th the pimples were not advanced, nor were they increased in number; and many of them had a dusky brown appearance. There was much

phlegm in the throat, and he had considerable difficulty of breathing, which at intervals was very much increased. The stools were dark coloured.

A blister was applied to the throat. The ipecacuanha emetic was repeated; and after the vomiting had subsided, he took one sixteenth of a grain of tartar emetic dissolved in water every four hours.

In the evening a paroxysm of difficult breathing came on, and he died in an hour afterwards.

Dissection.

The mucous membrane of the pharynx was inflamed. The trachea, bronchia, and air cells, were quite full of mucus mixed with bloody serum. The mucous membrane lining the trachea and bronchia was greatly inflamed, but there were no ulcers in any part of it. Neither the pleura nor the substance of the lungs was inflamed.

Observations.

The cutaneous eruption in this case was very moderate; neither did the disease proceed to that stage at which the secondary fever so frequently proves fatal. The fatal event was evidently occasioned by the affection of the respiratory organs. Dissection proved that inflammation had attacked the mucous membrane which lines the trachea and bronchia, and that its blood vessels had poured out mucus and serum, which accumulated in the bron-

chia and air cells. This was an impediment to those chemical changes which usually take place in the blood transmitted through the lungs, and suffocation consequently ensued.

CASE XI.

Variola proving fatal on the seventh day of the Eruption. On Dissection, the Mucous Membrane of the Lungs was found inflamed and ulcerated.

R. D., aged six, was exposed to the same source of contagion as his brother, whose case was last detailed. An eruption appeared on his body on the 16th of November, and he was very feverish.

He took an antimonial emetic, and, after its operation, three grains of calomel and three of rhubarb every four hours, until the bowels were freely moved.

On the 17th the pimples were more numerous, but those which had come out on the 16th were not advanced. There was great heat of skin, the pulse was hard, and the tongue very much loaded. The bowels had been freely moved.

He was directed two grains of antimonial powder three times a day.

On the eighteenth, a small vesicle appeared on the top of each pimple. He was still very feverish, and complained of soreness of the throat.

He continued the powders, and had a liniment,

composed of water of ammonia and oil, applied to the throat.

On the 20th the vesicles were raised into pustules, which were, for the most part, small, but not very numerous: they were, however, slightly confluent in the face. The bowels were very open. He still complained of soreness in the throat. The breathing was rather difficult, and he occasionally coughed. There was often a considerable collection of phlegm in the throat, at which times he screamed violently, but appeared to get relief by bringing up some mucus.

He was directed such quantities of tartar emetic as to keep up a constant nausea, and the powders were omitted.

On the 21st Dr. Wilson Philip accompanied me to visit the boy. The pustules were not very numerous, but they were small, and many of them were depressed in the centre, and of a dark brown colour. He appeared to breathe with ease, but there was a good deal of phlegm in the throat. The parents said, that he had occasional fits of difficulty of breathing, during which he screamed violently, and the voice was then shrill. The tongue was very much loaded, the pulse quick, the bowels open.

A blister was applied to the chest, and he continued the antimonial solution.

He was seized with a fit of difficult breathing

during the night, and died at five o'clock on the morning of the 22d.

Dissection.

The pharynx and the upper part of the glottis were sphacelated. A quantity of bloody matter escaped from the trachea when an incision was made into it. The mucous membrane lining the trachea and air cells was much inflamed, and about the middle of the trachea there were several small ulcers. The membrane lining the glottis was also much inflamed. There were no adhesions between the pleura pulmonalis and costalis; yet the lungs did not collapse when the thorax was opened. The bronchia and air cells were completely full of a bloody fluid. The blood vessels of the lungs were much loaded.

The right side of the heart was congested, though in other respects that organ was healthy.

Observations.

In this case the eruption was not at all severe, and there seemed to be no probability of danger from that source. From the commencement of the eruption there was some obscure affection of the breathing, which was attended with a slight cough, but never in such a degree as to give alarm. Even on the day before death, though his mother described him as subject to paroxysms of dyspnœa,

yet in the intervals the patient had but little affection of the respiratory organs. This must appear very singular, when the great degree of mischief which those parts had sustained is considered. A great portion of the glottis was sphacelated; the mucous membrane lining the trachea was beset with small ulcers, and that lining the bronchia and air cells was highly inflamed. Medicine could have had but little power in arresting so destructive an affection, even if the symptoms had been such as to warn us of its existence; but there were no indications of such extensive mischief going on in the respiratory organs, and consequently no very active remedies were employed.

CASE XII.

Bronchitis, which came on after the Disappearance of a Pustular Disease of the Scalp, terminating fatally.

On the 10th of February, 1819, E. M., aged four, was brought to the author with a pustular disease, which affected the scalp. By the application of the mild citrine ointment, and the exhibition of a calomel purge every second night, the eruption, in about a fortnight, left her.

In a week after the disease of the scalp had disappeared, she was again brought to the author. Ever since the eruption had left the head, the child

had been affected with a cough, which, for the two days antecedent to her second visit, had become severe, and the breathing very much oppressed.

On examining the child, the breathing was found very laborious, and it was attended with a wheezing noise. A violent cough came on at intervals, which was not accompanied with any expectoration. The countenance was pale, and expressed great anxiety, and the lips were rather blue. The pulse was quick and hard, the skin hot, and the belly regular.

She was bled from the arm, had a blister applied to the chest, and took an antimonial emetic; but was not in the slightest degree relieved. She died early the following morning.

Dissection.

The lungs did not collapse when the thorax was opened. A frothy matter escaped from the lungs when they were cut into. There was no abscess in the substance of the lungs, nor was the pleura inflamed. The mucous membrane lining the bronchia was very much inflamed, and several minute ulcers were observed in it. The cells were stuffed with tenacious mucus, which in many parts was copiously blended with a pus-like substance. The right auricle was very much loaded with blood.

The peritonæal covering of the liver was inflamed, and the vessels of the organ were congested.

Observations.

It is not an uncommon thing to meet with cases in which the sudden cure of chronic diseases of the skin is followed by visceral affections, and it seems probable that no organ is more frequently affected from this cause than the lungs. In the above example, the mucous membrane was the only part of those organs which was affected; but the inflammation was of so severe a nature as to prove fatal very speedily. It would appear that in all cases where affections of the lungs supervene on chronic diseases of the skin, their mucous membrane is most affected.

CASE XIII.

Bronchitis combined with Ulceration of the Trachea, terminating fatally.

A. W., aged forty-six, was received into the Worcester Infirmary on the 11th of February, 1815. She was affected with a phagedenic ulcer in the pharynx, which did not appear of syphilitic origin; but her habit was scrofulous. The ulcer healed in about six weeks, whilst she was taking large doses of extract of hemlock; and she was discharged cured. Shortly afterwards, she returned to the Infirmary with a short cough, and sensation of tickling at the glottis. The voice was a good deal altered: she expectorated matter of a purulent appearance, which was streaked with florid blood.

She pointed to the upper part of the trachea as the seat of all her uneasiness, and thought she should be choked. The pulse was 90, the skin hot, and the tongue rather white. She was again directed to take the cicuta, and a large blister was applied to the throat, which was kept open for some time. Under this plan of treatment she continued for two or three months, without any visible change of the symptoms, and the course of the disease seemed for a time suspended. In the beginning of the month of October she was much more comfortable than she had been for some time before. After an imprudent exposure to cold, however, the breath became more laborious; a distressing tightness across the chest and a severe headach came on. The pulse was 120, and hard, the tongue white, and the surface hot. These symptoms grew rapidly worse. She made a croaking noise during inspiration, and could only breathe in the erect posture. The skin was soon partially bedewed with perspiration, the pulse intermitted, and the lips assumed a purple hue. She died suffocated soon afterwards.

Blood-letting was had recourse to on the first appearance of increased dyspnœa, without any benefit.

Dissection.

A circular ulcer was found in the upper part of the trachea, about the sixth part of an inch in

diameter; the ulcer was granulated, and the edges of it looked red and healthy.

The mucous membrane lining the trachea and bronchia was highly vascular. The trachea, bronchia, and air cells, were filled with mucus, mixed with a considerable quantity of purulent fluid. There was no abscess, nor any appearance of inflammation, in the substance of the lungs.

The heart was healthy in structure. The right auricle and ventricle contained an unusually large quantity of blood.

The liver was paler than usual. The other abdominal viscera were quite healthy.

Observations.

This woman had, for some time previous to her death, been affected with an ulceration of the trachea; but the symptoms, for a month antecedent to the fatal attack, had been milder than formerly. The amendment appeared to arise from the free exhibition of hemlock and the frequent application of blisters. The immediate cause of death, however, does not seem to have proceeded from the ulceration of the trachea, but to have been produced by the extension of inflammation over the mucous membrane of the lungs. When an ulceration exists in any part of the trachea, the whole of the bronchial membrane is, no doubt, predisposed to inflammatory action; and in this case, the sudden exposure to cold was sufficient to bring about such

a degree of inflammation in this membrane as shortly proved fatal.

CASE XIV.

*Chronic Inflammation of the Trachea combined
with Acute Bronchitis.*

T. M., aged twenty-five, a farming servant, was received into the Worcester Infirmary on the 9th of May, 1819. For some months previous to admission his voice had been affected. He had felt an uneasy sensation about the middle of the trachea, and had complained of tenderness there when the part was pressed. In addition to these symptoms, he had been constantly teased with a tickling cough and slight expectoration. His appetite had gradually failed, and he had lost flesh.

About three days before admission he was exposed to cold, which brought on general fever. The breathing became laborious, and he felt a straitness across the chest. He spoke in indistinct whispers. The cough, which was very troublesome, caused a rending pain in the head, and was attended with a copious expectoration, occasionally tinged with blood. He referred all his pain to the middle of the neck. There was evidently some slight thickening about the middle of the trachea, and pressure of that part produced uneasiness, and very often a severe fit of coughing. Pulse 112, hard and full. Surface hot. Tongue white. Thirst considerable.

A blood-letting to the extent of twenty ounces relieved the dyspnœa, but the voice did not return, and the expectoration continued copious. On the following day, therefore, the blood-letting was repeated to ten ounces, and a blister was applied to the sternum. Two grains of calomel and two of antimonial powder were also exhibited every six hours.

On the 14th the cough was better, and the expectoration was lessened. The straitness across the chest, the dyspnœa, and the feverishness, had also abated. But although these acute symptoms, which seemed to be produced by exposure to cold, had subsided, the chronic disease of the trachea was not much relieved. He still complained of considerable pain about the middle of the trachea, and of tenderness there on pressure, and was unable to speak louder than a whisper.

By the repeated application of blisters, however, to the anterior part of the neck, and by the continued use of the calomel and antimonial powder for a month, the voice returned, the tickling cough went off, and the pain, tenderness, and thickening about the middle of the trachea disappeared.

He was dismissed from the Infirmary in perfect health.

Observations.

Chronic inflammation of the trachea had continued for a length of time in this case, and pro-

duced the symptoms peculiar to that local affection. An exposure to cold brought on the symptoms which are indicative of inflammation of the bronchial membrane, which were subdued by the copious abstraction of blood. But the chronic disease of the trachea remained some time afterwards, and only yielded to a long course of alterative medicines.

CASE XV.

Bronchitis combined with Bronchocele, proving fatal.

G. W., aged thirty, was admitted into the Worcester Infirmary on the 15th of January, 1815. She had been affected with bronchocele for many years, but had not felt any great degree of uneasiness from it till nine days antecedent to her application for relief. When she was admitted the breathing was laborious, and accompanied with a wheezing noise. She complained of a sense of tightness, and had a severe cough, with scanty expectoration. There was considerable pain in the enlarged thyroid gland, which felt hard, and the cellular membrane around it was thickened. The tenderness also was so great that the slightest pressure produced pain. Pulse 100, hard and full. Tongue white. Belly regular.

Ten ounces of blood were taken from the arm; six leeches were applied to the skin covering the

enlarged gland, and two grains of calomel were exhibited every six hours.

On the 16th the patient seemed in some degree relieved. The breathing was not so laborious, and there was less tenderness on pressure of the enlarged gland. The tension of the parts, however, remained quite as great as before the application of the leeches.

On the 17th the pain and tenderness of the enlarged gland became as great as when she was admitted. The breathing was very laborious. Each inspiration produced a shrill sound, and the voice was very indistinct. The cough was troublesome, and a thick mucus was expectorated. The pulse was quick, the surface hot, and the countenance very anxious.

A repetition of the general and local blood-letting did not at all relieve those urgent symptoms. Indeed the breathing became more oppressed, the expectoration ceased, the lips assumed a purple hue, irregular perspirations broke out, and she died on the morning of the 21st.

Dissection.

The thyroid gland was found greatly enlarged, and when an incision was made into it, a large abscess was discovered.

The inflammation appeared to have extended from this gland to the mucous membrane of the trachea, and also to that lining the bronchia, the

mucous membrane throughout being minutely injected with blood. The trachea, bronchia, and air cells, were filled with mucus mixed with pus.

The structure of the lungs was quite healthy. The pleura was not inflamed.

There were no marks of disease in the abdomen.

Observations.

In this case the thyroid gland was first affected; but the inflammation was afterwards communicated to the mucous membrane lining the trachea and bronchia. The fatal event was produced by the copious secretion of pus and mucus into the bronchia, which completely filled the air passages. It is probable that the inflammation and enlargement of the thyroid gland caused the disease of the bronchial membrane. It is very likely that a sympathetic affection of the trachea and bronchia at first took place, which afterwards terminated in inflammatory action.

CASE XVI.

Bronchitis combined with Pericarditis, terminating fatally.

J. B., aged sixteen, was admitted into the Worcester Infirmary in June, 1814, for an abscess in the right leg. The disease was found to affect the tibia. The discharge of matter was very pro-

fuse when the abscess was opened, and symptoms of hectic fever appeared soon afterwards. It did not seem at all probable that the boy's limb could be saved, and amputation was therefore recommended, although, from the great emaciation and decidedly hectic state of the patient, a favourable termination of the case was not anticipated.

He lost but little blood during the operation. On the following day, however, the countenance was anxious, the face flushed, and the pulse rapid. On the third day dyspnœa came on, with cough and slight expectoration, and he complained of pain and tenderness in the right hypochondrium. On the fourth day pain under the left breast, palpitation, irregularity of the pulse, and much anxiety of countenance, were conjoined with the before mentioned symptoms. He died early on the morning of the fifth day after the operation.

No very active treatment was employed. Eight leeches were directed to the breast, and a blister was applied to that part. He also took an antimonial mixture every four hours.

Dissection.

When the thorax was opened the lungs did not collapse. The trachea being divided, was found full of mucus, with which some purulent matter was mixed. The bronchia and air cells were also filled with the same kind of fluid. The mucous membrane lining the bronchia was in a high state

of inflammation. The capillaries appeared as much dilated as those of the tunica conjunctiva are in a severe attack of ophthalmia. The structure of the lungs was not diseased.

The posterior surface of the heart was united to the pericardium by recently deposited fibrine, and the whole of the pericardium was inflamed. The membrane lining the heart was redder than natural. The auriculo-ventricular valves were highly vascular, and covered with fibrine. The cavities of the right side of the heart were enlarged, and contained much more blood than is usually found in them.

The liver was enlarged; its colour was lighter than natural, and it exhibited the peculiar striated appearance so much resembling the section of a nutmeg.

The other abdominal viscera were healthy.

Observations.

The emaciated and hectic state of this patient seemed to forbid any very active treatment. The predominating symptoms were those denoting inflammation of the heart and pericardium. Those denoting inflammation of the bronchia either did not appear, or were overlooked in consequence of the attention being directed to more prominent symptoms.

This inflammatory affection, in all probability, commenced after the limb was removed, and may,

perhaps, be attributed to congestion in the internal parts, arising from the blood having to pass through a diminished number of vessels in the extremities.

CASE XVII.

Bronchitis combined with Inflammation of the Heart and Stomach, terminating fatally.

C. A., aged thirty, was received into the Worcester Infirmary on the 15th of April, 1814. He was a traveller, and had been taken ill on the road three days previous to admission. He complained of pain in the head, back, and limbs, nausea, occasional rigors, dyspnœa, slight cough, and mucous expectoration. The pulse was small and quick, the tongue dry and brown, the thirst urgent, the surface dry and hot, and the bowels regular.

He was directed an antimonial emetic, and eight ounces of blood were taken from the arm. A blister was applied to the epigastrium, and he took a bolus containing five grains of calomel and ten of jalap.

He appeared relieved by the blood-letting, for the pulse was afterwards fuller, and the breathing not so much oppressed. In the course of the night he became suddenly worse, and died in a few hours afterwards. The nurse who was with him said that he suffered principally from dyspnœa.

Dissection.

The vessels of the brain were found in some degree dilated, but there was no appearance of inflammation of its membranes, nor any fluid effused into its ventricles.

When the thorax was opened the lungs did not collapse, but there was no inflammation of the pleura. An incision being made into the lungs, a frothy fluid escaped, but their structure was not diseased.

The trachea, bronchia, and air cells, were full of tenacious mucus. The membrane lining them was highly vascular and thickened, and in some parts a fluid resembling pus was adhering to it.

The pericardium and the external surface of the heart were healthy. The whole of the membrane lining the cavities of the heart was inflamed, and the auriculo-ventricular valves were covered with fibrine.

The mucous membrane of the stomach was inflamed, and several minute ulcers were observed in it.

The other viscera were healthy.

Observations.

The inflammation of the bronchial membrane was not suspected before death. It was thought that this patient laboured under the common symptoms of fever when admitted, and he was not

considered in immediate danger. The cough and dyspnœa were not at all severe, and he was so much better for the venesection that there did not seem any reason for apprehending a speedy termination of the disease. It is to be presumed that there was a sudden and considerable aggravation of the bronchial inflammation during the night, which caused such a copious secretion into the air cells as to prevent the necessary changes in the blood. It is remarkable that in this, as in the former case, the inflammation of the mucous membrane of the lungs was combined with inflammation of the membrane lining the cavities of the heart.

CASE XVIII.

Bronchitis combined with a chronic tubercular Disease of the Pleura and Peritonæum.

G. H., a young woman, seventeen years of age, was visited by the author in January, 1819. She had been ill for some months with vomiting and pain in the abdomen. She was greatly emaciated. The abdomen was swollen, tense, and hard, and when it was pressed she suffered considerable pain. The countenance was sharp and anxious, the pulse quick, the tongue morbidly red, the thirst considerable, and the stools light coloured. The catamenia had disappeared.

She had been frequently bled, and had taken cathartic medicines.

A seton was cut in the skin of the abdomen. She was directed to take a grain of calomel twice a day, and the saline effervescing draughts whenever the nausea came on.

The disease was not at all arrested by this plan. In a fortnight after she commenced taking the calomel the mouth became slightly affected. She therefore discontinued it, without feeling at all relieved.

She died in the middle of February. For a week previous to her death the nausea and vomiting were almost constant, and the anxiety and restlessness were very distressing; but she never coughed, nor complained of any great degree of dyspnœa. She took opiates during the last week of her life, which in some measure alleviated the symptoms.

Dissection.

The intestines were united together so as apparently to form one mass. The peritonæum was covered with tubercles of various sizes, but most of them were not larger than small peas. About three pints of a yellowish serum had collected in the cavity of the abdomen.

The liver was lighter coloured than natural. On opening the thorax a number of tubercles, precisely similar to those on the peritonæum, were found interspersed on the pleura.

The substance of the lungs was not diseased.

The mucous membrane, however, lining the trachea and bronchia, was found inflamed, and in some places was covered with a pus-like fluid. The heart was healthy.

Observations.

The abdomen was considered the seat of the disease in this case. So little, indeed, was disorder suspected in the thorax, that it was not thought at first necessary to examine that cavity. This was a striking example of the extent which disease may sometimes attain in the bronchial membrane and pleura without any of the accustomed symptoms being produced.

CASE XIX.

Bronchitis without any of its usual Symptoms.

M. Q., aged eighteen, of fair complexion, was admitted into the Worcester Infirmary on the 4th of April, 1820. The following report was at that time taken of her case.

She is affected with pain and tenderness all over the abdomen, and also with pain in the limbs. The skin is very hot. The tongue is dry and covered with a brown fur. The pulse is 120 and full. The bowels are open. The countenance is pallid.

She was taken ill a week ago with headach and fever. The pain in the abdomen came on four days afterwards.

She has been bled twice, and has taken cathartics, but these remedies have not relieved her.

Applicentur Hirudines xxiv. abdomini.

R Potassæ Nitratis, gr. x.

Liq. Antim. Tart. ʒss.

Mixturæ Salinæ, ʒj.

Fiat haustus, quartâ quâque horâ sumendus.

R Hydrarg. Submuriatis, gr. i.

Confectionis Rosæ, quantum sufficit ut fiat pilula, octavis horis sumenda.

On the 6th there was no pain or tenderness of the abdomen. The tongue was cleaner, and the skin cool.

She continued the mixture and the pill.

On the 8th the general surface of the abdomen was not at all tender; but she had pain and much tenderness in the epigastrium and right hypochondrium. Pulse hard. Bowels constipated.

Eight ounces of blood were taken from the arm. Ten leeches were applied to the epigastrium, and she continued her medicines. One drachm of Epsom salts was added to each draught.

The blood was not buffed.

On the 9th she had passed a restless night, but did not complain of pain or tenderness in any part of the abdomen. Pulse 120, hard.

Perstet.

Imponatur Emplastrum Lyttæ epigastrio.

On the 11th the blister had operated well. She did not complain of any pain, but was restless; and

the countenance expressed great anxiety. Bowels regular. Tongue dry, and brown in the centre. Great thirst. Pulse 140, not at all hard.

Perstet.

On the 13th she had no pain or tenderness in any part of the abdomen, but she appeared stupid. Bowels regular. Pulse 120, not hard.

Perstet.

Applicentur Hirudines ij. singulis temporibus.

On the 15th the pain and tenderness of the abdomen returned. The bowels were open. Dejections natural. Pulse 100.

Perstet.

Applicentur Hirudines x. abdomini, postea

Emplastrum Lyttæ imponatur.

On the 17th she had passed a restless night; the leeches and blister had operated well. The countenance was more natural, the tongue cleaner, and the bowels open. The mouth was slightly affected.

R Hydrargyri Submuriatis, gr. i.

Pulveris Opii, gr. ss.

Confectionis, q. s. ut fiat pilula, ter die sumenda.

Omittantur haustus et pilula.

On the 19th there was no tenderness or tension of the abdomen on pressure. She said she had no pain. The countenance was distressed. The eyes glassy. Pulse 160, not at all hard. Tongue dry and brown. Bowels open. The gums were not at all affected.

Perstet.

On the 20th the pulse was rather hard, and she complained of some tension and tenderness of the abdomen.

Repetantur Hirudines.

Perstet in usu pilulæ, et augeatur dosi Hydrargyri Submuriatis, ad gr. ij.

On the 21st she had passed a restless night. There was no tenderness of the abdomen. The countenance was less anxious. The bowels were open. The tongue brown and dry. Pulse 130, hard.

She died on the 22d.

Dissection.

The peritonæum was in general healthy.

The liver was pale, and much softer than natural.

The lymphatics on its surface were very large.

The spleen was pulpy, and its peritonæal coat was much inflamed. The pancreas was healthy.

The intestines in general were not inflamed, but the ileum was very much so.

All the mesenteric glands appeared diseased. Those which were included in that part of the mesentery which was near to the inflamed ileum were also inflamed, and some of them were nearly gangrenous. In other parts the glands were of a saffron colour, rather enlarged, and pulpy. In one of them some gritty matter was found.

There was a large quantity of fecal matter in the cœcum.

Thorax.—Each of the cavities of the thorax contained about eight ounces of a serous fluid, but the pleura was not inflamed.

The lungs did not collapse when the thorax was opened. The trachea was found full of frothy mucus and pus, as were also the bronchia and air cells.

The bronchial membrane was very red, but no ulcers were detected.

In some parts the structure of the lungs was hardened, and they appeared too vascular; but there was no abscess in the lungs. The structure of the heart was healthy, but the membrane lining it was inflamed, and the pericardium and heart were united together.

Head.—There was a good deal of serous fluid contained between the pia mater and arachnoid membrane. The substance of the brain was quite healthy. There was no fluid in the ventricles.

CHAPTER IV.

OF CHRONIC BRONCHITIS.

IN the preceding chapter a pretty full account has been given of bronchial inflammation when of the acute kind. The more difficult task of describing the several varieties of chronic bronchitis is now to be performed. It will be found, as we proceed, that this embraces a wider field of investigation than we should have at first sight supposed. Chronic inflammation of this membrane is so often connected with other affections, and so frequently gives rise to extensive mischief in the thoracic viscera, that the consideration of this disease will necessarily lead us to discuss the nature of some other affections which are occasionally combined with it.

Of the Symptoms of Chronic Bronchitis.

1. If the patient be advanced in life, the inflammation of the bronchial membrane, when it has continued some time, frequently assumes the character of chronic cough, which may be considered as the first variety of bronchitis chronica.

The cough generally attacks the patient in the commencement of the cold weather, and some-

times continues throughout the whole of the winter months.

The mucous membrane is so irritable that the slightest change of temperature is sensibly felt. The respiration is always uneasy, and a peculiar wheezing of the breath is often present. The cough is most violent in the morning, the patient never failing to cough for a considerable time after he awakes; and the fit of coughing seldom goes off till the air cells are unloaded of the secretions which have collected there during the night.

Throughout the day the cough is often quiet for several hours together, and only comes on in consequence of increased exertion, or when the stomach is loaded with a hearty meal. The expectoration is copious, and usually consists of tenacious mucus mixed with a pus-like fluid. Sometimes, however, it is much less consistent, and it is white and frothy.

The patient has seldom any pain in the chest, and if he have, it is slight and transient. Some symptoms indicative of disorder in the digestive organs are generally present. There is a sense of weight in the epigastric region, and the patient is frequently affected with pain in that part. The tongue is white and loaded, and the appetite fails. The pulse is quicker than natural, though rarely hard. The urine is often high coloured, and not seldom scanty. The bowels are irregular.

Such a combination of symptoms as that above

stated is common; but we sometimes meet with chronic bronchitis which has existed for some time without producing much constitutional ailment. The patient is affected with cough, copious expectoration, and uneasy respiration; but there is no fever, and the pulse is not at all accelerated.

These symptoms occasionally become the foundation of a hydrothorax, but more commonly as the warm weather comes on the cough subsides, and the patient's health is restored.

2. It sometimes happens that chronic bronchitis resembles tubercular consumption*. When this occurs, if the disease have arisen from cold, the symptoms of catarrh are gradually lost in those of the former disease. The cough which is present in catarrh becomes more severe, particularly on first lying down in bed and very early in the morning. The expectoration is very copious, and various in appearance, but widely different from that in catarrh. Some part of the matter expectorated is in lumps, which vary in size from a small pea to that of a common bean. They fall to the bottom when thrown into water, and cannot be diffused in it. They are very viscid and coherent, and are sometimes translucent, sometimes opaque. As well as the lumps, there is often a flaky substance, which has occasionally a ramified appearance, not unlike the divisions of the bronchia.

* See Case 1.

When the patient spits in water, this kind of matter rarely sinks to the bottom : it usually swims, retains its tenacity for some time, and is not dissolved. There is for the most part a third kind of matter expectorated, which is white, yellow, or greenish. It generally sinks in water, and differs more especially from the other two kinds, in the comparative ease with which, by agitation, it may be broken into ragged portions, and in a manner diffused in water. Lastly, with these different coloured and formed sputa we have often combined small quantities of blood, which either give a general colouring to the whole mass, or, what is more common, appear in streaks. The quantity expectorated at this period is considerable, but falls very far short of what is spit up at a more advanced stage of the disease.

The breathing is also much affected. It is quickened, and often laborious. The patient frequently complains of an oppression and sense of tightness across the chest. When desired to take a deep inspiration, he does so without pain, although it is generally accompanied with a sense of straitness about the middle of the sternum. The pulse at this period varies very considerably, both as to frequency and strength, according to the age and constitution of the patient, and according to the circumstances under which it is felt. Before rising in a morning it rarely exceeds 90, though it is generally sharp. No sooner does the patient assume the erect posture than the frequency of the

pulse is increased, and continues so throughout the day, becoming as high as 100 or 110. In the evening it receives an additional augmentation, and is often found as high as 120. The heat of the surface is always above the natural standard, but the degree of increase varies much. Sometimes it is almost pungent, whilst in the majority of cases the heat is very slightly raised. Throughout the day the skin is dry, and sometimes the surface of the body is rough. In the night partial perspirations break out, which more especially appear about the head and breast. The desire for drink is always greater than in health. The urine is constantly high coloured, and deposits a copious red sediment. The face is often pallid, but there is sometimes a flush on the cheek, which more frequently appears during the evening febrile exacerbation. At the same time that the symptoms above enumerated occur, the patient visibly loses flesh and strength, and becomes more unequal to every kind of exertion.

The disease does not long continue stationary; for if its progress be not checked, it daily gains ground, and the foregoing symptoms then are but the precursors of those of a more formidable nature. The debility and emaciation proceed rapidly. The cough becomes very distressing, and is accompanied with the most profuse expectoration. The quantity of matter in some instances is really astonishing; a pint and a half is sometimes expectorated

during the night! At the same time that it is increased in quantity it becomes much altered in quality. We rarely see so many of the dense lumps which so constantly sink in water. There is still a considerable portion of a tenacious flaky matter, which is not easily diffused in the water, and sometimes swims on the surface, and at others falls to the bottom; but by far the greater part is now of a yellow or greenish colour. It sinks generally in water, and by agitation may be separated into many parts, which are, in some degree, diffusible in water. The quantity of blood in the sputa is sometimes increased, and occasionally (though this rarely happens) pure blood is expectorated. The difficulty of breathing is very much increased. A distressing sense of tightness and weight across the chest is constantly present, and the patient is rendered breathless by the slightest exertion. The pulse becomes much quicker than in the earlier periods of the disease; it is seldom less than 120, and during the evening exacerbation much more frequent. The tongue becomes cleaner, and, in many cases, all fur is removed: it assumes a shining appearance, and is redder than in health. The thirst is not great. The heat of the surface is always raised. Towards evening there is invariably an exacerbation of the fever, and this more especially shows itself after taking food. The face flushes, and, at this advanced period of the disease, the heat of the surface does not continue long

before a sweat begins to appear. Towards morning it goes off, and leaves the patient much exhausted. The appetite for food, even at this late period, is not very bad. The body is inclined to constipation early in the disease; but as the aggravated symptoms advance, a diarrhœa comes on, and, under these accumulated ills, the patient at length dies with all the appearances of tubercular phthisis.

An account has been given of the symptoms of the first stage of chronic bronchitis, which have a considerable resemblance to those of tubercular consumption, and also of the characters of the last stage of the former disease, which so exactly correspond with those of the latter, that the previous history of the disease can alone lead us to distinguish the one from the other. Fortunately, however, under proper management of the first stage, the occurrence of the more aggravated state of the disease may often be prevented. Even by the unassisted efforts of nature we frequently see the cough and expectoration diminish, the breathing become freer, the pulse lose its frequency, the patient recover his flesh and strength, all the untoward symptoms vanish, and the health completely re-established.

3. Chronic bronchitis, perhaps, more frequently follows severe attacks of catarrh than any other disease. It often, however, arises from more severe bronchial inflammation; and the course of the chronic affection is, under such circumstances,

considerably modified*. We do not in this event observe the slow and gradual progress of the first stage, which is so remarkable when this disease supervenes on catarrh; for the acute inflammation has previously reduced the patient to the lowest state of debility, and the powers of life are sunk.

The respiration is oppressed and laborious, the cough is frequent and harassing, the pulse rapid, and death is hourly expected. It, however, sometimes happens, that the violence of these apparently fatal symptoms is in some measure subdued by proper treatment, and the disease assumes a chronic form. The patient, perhaps, gains some strength, and is enabled to sit up for a short time. The cough is mitigated, the respiration is less laborious, and the wheezing is not so perceptible. The expectoration, however, is increased; the matter expectorated is not of the same nature throughout: some part of it is tenacious, translucent, and cannot be diffused in water; other parts are opaque and purulent. Small quantities of blood are now also often intermixed with the sputa: the pulse loses its hardness, but becomes weaker and much quicker. We have generally combined with these unpromising symptoms increased emaciation, and inability to make any muscular exertion. Irregular sweats often break out, and a flush appears on the cheeks.

In some examples, the untoward symptoms do

* See Cases 2 and 3.

not proceed further; they gradually amend. The expectoration diminishes, the cough is less harassing, and the respiration not so uneasy. The patient begins to gather a little strength, and the appetite returns. A change of air and favourable seasons are particularly advantageous at this period, and by these means the patient frequently recovers his health, although months sometimes elapse before such progress is made as enables us to speak with any confidence as to ultimate recovery.

But if no such alteration in the character of the disorder take place, a greater degree of general debility occurs, with a further loss of flesh. The cough becomes extremely harassing, the respiration more quick and laborious. The expectoration increases, and is more purulent in its appearance. The pulse is rapid. During the night general perspirations break out, and the face in the day is often flushed. The patient can still, for the most part, take a deep inspiration without pain, and lying down does not produce much increase of dyspnœa. He seldom complains of any shooting pain in the breast.

Even from this almost hopeless state patients occasionally recover; but when the disease has existed so long as to cause extreme emaciation and very copious pus-like expectoration, there is little or no hope.

It sometimes happens that dropsical symptoms come on before death, in this as in other varieties

of chronic bronchitis, and in a much larger proportion than in tubercular phthisis. In another part of the treatise this termination will be considered, and observations made on the frequent connexion between bronchial inflammation and dropsy.

4. When chronic bronchitis follows cutaneous diseases, it is not always attended with the same symptoms. It occasionally happens, that the disappearance of an eruption is soon succeeded by the symptoms of acute bronchitis, which, after continuing some time, degenerate into a chronic state. If this take place, the course of the disease does not differ from that of the variety last described*.

It is a more frequent occurrence when any habitual eruption disappears, for a chronic disease to form in the bronchial membrane, which is not preceded by any acute attack. In this event the symptoms produced may be either those of chronic cough, as in the first, or may resemble those of tubercular phthisis, as in the second variety†. In either of these cases the disease is very obstinate, and sometimes resists all remedies until the cutaneous affection returns.

5. Chronic bronchitis is sometimes the result of irritating substances acting on the mucous membrane. Besides the contamination of the air by gaseous substances, it is occasionally loaded with

* See Cases 4 and 5.

† See Cases 6 and 7.

impurities, which may act mechanically on the delicate texture of the mucous membrane. The effect of these is generally a disease of a chronic nature. Thus Diemerbrook opened the thorax of three stone-cutters, who died of an asthmatic affection, and found a large quantity of the dust of stones in the bronchia and air cells; so large a quantity, indeed, as almost to fill them. In this town, the preparers of yellow leather, and those employed in some parts of the china manufactory, are often subject to severe attacks*. They are exposed during some part of the process to inhale an air loaded with dust, which produces inflammation of the bronchial membrane of a chronic nature, often differing in the first attack from those we have hitherto described. Dyspnœa is generally the primary symptom, which is often neglected for many months. If the occupation, under these circumstances, be continued, the disease is aggravated. The patient is not unfrequently seized with hæmoptysis, which is occasionally very profuse, and is accompanied with a great increase of dyspnœa, and severe cough. The pulse too becomes accelerated, and is generally hard and strong. The surface is hot, the tongue white, and there is considerable thirst: occasionally blueness of the lips and general lividity of the countenance also appear. It often happens that we can arrest the

* See Cases 8, 9, 10, 11, 12, and 13.

hæmorrhage by blood-letting and astringents ; but in all the cases of this description which have occurred to the author, the hæmoptysis has been followed by very untoward symptoms.

Whether hæmoptysis have come on or not, if the bronchia be still subjected to irritation, the cough increases, and is attended with a copious expectoration of thick mucus, which is mixed with pus-like matter, and sometimes streaked with blood. The patient complains of an uncomfortable tightness across the chest, and the dyspnœa does not abate. He loses his flesh, the pulse becomes quicker, the tongue continues loaded, and there is considerable thirst. In by far the greater proportion of these cases, if the occupation be relinquished, these symptoms, by an appropriate treatment, disappear, and the patient is restored to health. In others the termination of the disease is not so happy. The patient emaciates. He has profuse night sweats, and the cough harasses him to such a degree as to prevent his resting by night. The expectoration is prodigious, and becomes much more purulent. The dyspnœa is greatly increased, the pulse is very quick, and there are regular evening exacerbations. The patient at length dies exhausted.

6. Let us now consider chronic inflammation of the bronchial membrane, as connected with diseases of the abdominal viscera.

One of the most common diseases with which

this affection of the lungs is combined, is a chronic disease of the liver*. It very often happens, that in the commencement of this modification of the disorder we have no symptoms which can lead us to suspect any pulmonic affection. They are altogether such as are usually produced by hepatic disease. We have pain in the right hypochondrium, inability to lie on the left side, irregularity of the bowels, loaded tongue, and depression of spirits. The first warnings of disease in the bronchial membrane are very slight. There is a dry cough, unattended with any pain, which is often considered the necessary attendant on hepatic affection. By degrees the cough becomes more troublesome, and when it continues for some time, a tenacious mucus is expectorated. The breathing, too, is in some degree affected, and the patient complains of a weight and tightness across the chest. As the disease advances the cough is more troublesome, and the expectoration becomes copious: still, however, we do not trace much of the purulent character in the matter expectorated; it is principally mucus. The expectoration, however, in a more advanced stage, increases in an astonishing manner, and at length becomes purulent. Blood is not unfrequently mixed with the colourless matter, and sometimes pure blood is coughed up in the early stage of the disease; but in the cases

* See Cases 14, 15, 16, 17, and 18.

of this kind which have been seen by the author, it is not a common occurrence.

The breathing is generally oppressed, though it sometimes happens that we have considerable cough and expectoration without much dyspnœa; and exercise does not produce much labour of respiration.

The pain, which is of a dull kind, and referred to the pit of the stomach, is not constant, and, in many cases, little or none is complained of; but the patient is always affected with tenderness in the epigastric region.

If these symptoms proceed, marks of an irregular hectic show themselves, differing considerably from the completely formed hectic of tubercular phthisis. It is true there is usually some evening exacerbation, during which the face is generally flushed. The hands and face, also, are occasionally bedewed with perspiration in the night; but this, for the most part, goes off before morning. The emaciation becomes very perceptible, though it does not proceed so rapidly as in tubercular phthisis.

Along with these symptoms denoting affection of the lungs, the disease of the digestive organs is well marked. Flatulence, irregularity of the bowels, furred tongue, impaired appetite, sense of fulness in the epigastric region, almost constantly attend. Moreover, there appears a decided connexion between the abdominal and the pulmonary symptoms, for the dyspnœa and cough are always worse when

the digestive organs are much oppressed, particularly when flatulence succeeds, as it very often does in such cases, a hearty meal. Whenever also the epigastrium is more than usually tender, there is usually a corresponding increase of the cough.

If the progress of the disease be not checked, it soon assumes a more formidable character, and the symptoms approach still nearer to those of tubercular phthisis. The breathing is more oppressed, the slightest exertion producing laborious respiration. The emaciation proceeds to the last degree. Hectic fever becomes completely formed, and the patient is wasted by profuse perspiration. All the symptoms supposed to indicate a tubercular state of the lungs come on, and death ensues: frequently, however, dropsical symptoms make their appearance before that event occurs.

Diseases of the other abdominal viscera are also sometimes combined with those of the lungs, and with none of them more commonly than with inflammation of the bronchial membrane.

Ulceration of the stomach occasionally occurs in connexion with chronic bronchitis; but the disease, in these cases, differs considerably from that which takes place in combination with hepatic affection; for subjects thus affected are generally much emaciated before any marks of pulmonic inflammation come on*. Besides, they have generally passed the

* See Cases 19 and 20.

middle of life, and have complained of frequent vomiting, and other symptoms of gastric disease, for a long time antecedent to the pulmonic symptoms, which usually make their appearance very insidiously. A dry cough first attracts attention, which is sometimes accompanied with wheezing respiration and some difficulty of breathing. A considerable sense of oppression is also felt immediately under the sternum; but no pain is excited in the chest by a full inspiration. At the same time that the pulmonic attack occurs, the disease of the stomach often appears somewhat relieved. The vomiting does not return so frequently, and the desire for food is rather increased than diminished. The pulse becomes quicker and harder, and the heat of the surface greater.

The disease progressively advances. Respiration becomes more wheezing and laborious. The cough is more troublesome, and is attended with a more copious expectoration; and with the mucus, which at first was brought up uncombined with any other matter, a quantity of purulent fluid is now blended.

As the disease proceeds, the sputa become more decidedly purulent, and the quantity of mucus gradually diminishes. No sooner does a free expectoration of purulent matter commence, than the emaciation, which before the appearance of the pulmonic symptoms is very perceptible, becomes more rapid than it has been at any period of the progress of the gastric affection. The well marked

evening exacerbations, the flushed cheeks, and night perspirations, denote the commencement of hectic. The gradual increase of all the pulmonic symptoms renders it too evident that the patient must, at no distant period, fall a victim to this complicated disease; and from the previously exhausted state of the body, the fatal event may be expected soon after the accession of hectic fever.

Pectoral attacks, in their symptoms very much resembling tubercular phthisis, have been long known occasionally to supervene on long continued disease in the mesenteric glands, and to chronic disease of the peritonæum. Such attacks sometimes arise from inflammation of the mucous membrane of the lungs. In cases of this kind, which have hitherto been referred to a tuberculated state of the lungs, it will, perhaps, on further investigation, appear that the disease is sometimes confined to the mucous membrane lining the bronchia and air cells. This happened in the twenty-first Case, but in the twenty-second the chronic inflammation had also extended to the substance of the lungs.

Of the Appearances on Dissection.

The lungs do not collapse when the thorax is opened; and when an incision is made into them, a considerable quantity of frothy fluid escapes.

The effects of inflammation can always be discovered in the mucous membrane of the lungs; but these effects are not in all cases similar. The

capillaries of the membrane are always dilated, and full of red blood: the degree, however, to which this takes place varies.

In the most marked examples the membrane is throughout like a congeries of vessels, and very much resembles the villous coat of the stomach or bowels, when a fine red injection has passed into its minute vessels. Sometimes the colour of the membrane is not as last described, but approaches to purple. Occasionally the capillaries are only dilated in patches, and the intervening spaces are nearly natural. The bronchial membrane is usually thickened, and not unfrequently its surface is pulpy.

It is not at all uncommon to find this membrane ulcerated. This happens more particularly when the disease has arisen from the irritation of mechanical substances. The ulcers are always superficial, and generally small; but occasionally in the larger bronchial cells they are of considerable magnitude, and oblong, or oval, in shape. In the leather dressers of this town who die of chronic bronchitis, the mucous membrane is, according to the observation of the author, always ulcerated, and in those instances he has seen more extensive ulceration than in any other.

The bronchia and air cells are almost always filled. The matter contained in them has not in all cases a similar appearance; but there is usually a considerable proportion of it which has a purulent aspect, and with it, mucus, a bloody serum, and

a frothy substance, are often intermixed. Occasionally, instead of these latter, a dark brown fluid is mixed with the purulent matter, and sometimes pus and blood only are detected.

The diseased appearances are not always confined to the mucous membrane; they are also sometimes extended to the substance of the organ. The most common deviation from the natural state is a certain degree of thickening of the substance of the lungs, from which they become more solid. In the majority of instances this does not take place to any great degree, and then the increased solidity is scarcely observable; but sometimes the lungs are converted into a substance very similar to liver. This appears to arise from the extension of inflammation to the substance of the lungs, in consequence of which a large quantity of coagulable lymph is deposited in their cellular structure.

Sometimes tubercles are formed in the structure of the lungs, when their mucous membrane is inflamed. These are generally found in an incipient state; but in some instances they proceed to supuration. Now and then it happens that the general substance of the lungs becomes solid, and tubercles form at the same time: if this occur, the tubercles in general are not numerous.

The pleura is often diseased. Adhesions take place, and not unfrequently the whole of the serous membrane is full of tubercles.

The blood vessels of the lungs are always loaded

with blood, and dilated beyond their natural size. This is particularly remarkable in the larger blood vessels. The heart is often affected. Both the auricles, but particularly the right, are dilated beyond their usual size. The right ventricle is also sometimes larger than natural. The right cavities of the heart contain much more blood than in ordinary cases. The auriculo-ventricular valves are sometimes thicker than when in a healthy state. If symptoms of abdominal disease have preceded the pulmonic attack, or indeed, in some examples, if no such symptoms have occurred antecedent to it, disease is detected in the abdominal viscera, and any of them may be affected ; but the liver is most frequently diseased.

It is generally enlarged and hard, and sometimes exhibits that peculiar nutmeg appearance which is so common. Its peritonæal coat is often very much thickened, and occasionally tuberculated. In some examples tubercles are also found in the substance of the liver ; but this does not very frequently happen.

When symptoms of diseased stomach have preceded those denoting pulmonary affection, that organ is often found ulcerated.

When bronchial inflammation has succeeded to long continued abdominal inflammation, the peritonæum is usually much diseased, being closely adherent to the bowels, and thickened. The whole of its reduplications on the viscera are sometimes

thickly beset with tubercles of various sizes, some not exceeding a pin's head in magnitude, others as large as a pea. In some parts of the serous membrane, many of them being clustered together give it a very unnatural appearance for a considerable extent. The intestines are all closely united together, and their peritonæal covering is apparently much inflamed*.

The cavity of the abdomen generally contains a quantity of yellowish fluid, which has flakes of gelatinous matter swimming in it.

The mesenteric glands are frequently found much enlarged, and occasionally suppurated.

Of the Ratio Symptomatum of Chronic Bronchitis.

Let us consider how far the history of this disease, and the account of the appearances on dissection, throw light on the nature of its symptoms.

The mucous membrane is always found highly vascular, and often ulcerated. It is from this membrane that such amazing quantities of matter are poured out. The fact is well ascertained, that secreting surfaces, when irritated, often pour out purulent matter. Whenever in chronic bronchitis

* These appearances are similar to those so faithfully described by Dr. Baron in his work on "Tuberculated Accretions of Serous Membranes."

the quantity of pus thus secreted is considerable, great debility and emaciation must necessarily be produced, because a large portion of the blood intended for the support of the system is wasted. Hectic fever, which, experience teaches us, never fails to attend when the body becomes emaciated by profuse discharges of purulent matter, always occurs towards the close of the disease, in consequence of the suppurative process which is constantly going on in the mucous membrane.

The hæmoptysis, which sometimes takes place, no doubt arises from small blood vessels, which are greatly loaded with blood, being either ruptured by its pressure or eroded by ulceration.

The dyspnœa is accounted for by the enlargement of the vessels of the lungs. They are always found on dissection greatly distended with blood. This varicose state of the blood vessels of the lungs must necessarily diminish the capacity of the air cells, and thus give rise to dyspnœa. The manner in which this state of the vessels of the lungs is produced will be rendered very evident by reflecting on the necessary effects of a long continuance of inflammation of the mucous membrane lining the bronchia and air cells. It is evident, from what we said of acute bronchitis, that the changes in the blood must be inadequately performed during the existence of chronic bronchitis, and that the blood in its venous state is not the proper stimulus

of the arterial vessels. They do not consequently contract on it so vigorously, and it accumulates in them. The larger vessels soon feel the effects of this obstruction, and must become overloaded with blood. If the disease continue long, this distention of the blood vessels of the lungs becomes habitual, and they are as varicose as those of the extremities by the pressure of a gravid uterus, or any other cause.

But not only do the blood vessels of the lungs become enlarged and varicose; it appears also that the cavities of the heart are often dilated in protracted cases of chronic bronchitis. Many dissections have proved that the auricles of the heart, particularly the right, sometimes acquire a very disproportionate size. The right ventricle is also frequently enlarged, but there is rarely any dilatation of the left ventricle*.

In this manner a much greater portion of blood than natural is thrown into the venous system. Hence occasionally a general blueness of the skin, indicative of this turgescence of the veins, is observed†.

No sooner does the venous system suffer this dilatation, than the arterial system is also affected. The imperfect venous circulation prevents the blood passing on from the capillaries; and consequently there is for a time an increased resistance to the

* See Case 10.

† See Case 11.

flow of blood, which produces an increased action of the ventricle.

Is it surprising that under such circumstances a weak and dilated heart, by the repetition of the attack, loses its vigour, and that the internal veins, already disposed to be varicose, become at length so feeble as to give way to continual distention? The pressure thus exerted on the veins and on the general absorbents must also oppose the free transmission of blood by the minute vessels, and cause an accumulation of the exhaled fluids in the several cavities of the body. Hence general dropsy succeeds; of which hereafter.

Chronic inflammation of the bronchial membrane is not unfrequently combined with other affections of the lungs, particularly with induration of their substance and tubercles. When the close connexion of the air cells with the substance of the lungs is considered, it cannot be thought remarkable that inflammation should frequently extend from the mucous membrane to the substance of the lungs. The effect of chronic inflammation thus excited is to cause an extravasation, which produces an increased solidity of the lungs*.

Experience teaches us, that whenever any part of the lungs is subjected to a slow inflammatory action, tubercles are very likely to form; which, by the irritation they excite in the lungs, are the occa-

* See Cases 5 and 8.

sion of new disturbance in the system. Hence chronic inflammation of the bronchia may in many instances become the origin of tubercular phthisis; and the fact is, that in those who are predisposed to that disease a long continuance of inflammation of the mucous membrane of the lungs almost unavoidably brings on a tuberculated state of that organ*.

We have no other means of explaining the connexion of abdominal disease with chronic bronchitis than by referring to the sympathy which is known to take place between these different parts of the animal economy. That such connexion between different parts of the system does occur, is abundantly proved by the experience of ages. This is not a speculative illusion, but a truth, which every man of observation must have seen confirmed in numberless examples. The greatest success in the practice of medicine is derived from tracing to their origin obscure sympathetic affections, which depend on disease in some distant part. In the combination of hepatic disease and chronic bronchitis it is of the utmost importance to keep this connexion in view; for we may as well attempt to cure a sympathetic pain in the shoulder, which is dependent on some organic affection of the liver, by remedies which are not calculated to remove the hepatic disorder, as to enter on the treatment

* See Cases 15, 17, 18, and 22.

of chronic bronchitis, originating in abdominal disease, without an acquaintance with the nature of the primary affection, or the remedies best adapted to its cure.

Hepatic disease more frequently precedes inflammation of the mucous membrane of the lungs than any other abdominal affection.

When chronic disease of the peritonæum brings on inflammation of the bronchial membrane, if the disease of the former have proceeded to that stage in which granulations and tubercles are formed on its surface, the powers of art are too feeble to combat with such extensive mischief, and nothing can arrest the progress of the disease of the lungs; it slowly proceeds to the cellular membrane, and before the death of the patient the whole texture of the organ is much disorganized*.

If ulceration of the stomach have called inflammation of the mucous membrane into action, it is manifest, since we cannot cure the former, that we have no means of arresting the progress of the latter. Such cases almost always proceed uncontrolled by medicine, and before death the lungs are much diseased in every part of their structure†.

* See Case 22.

† See Cases 20 and 21.

Diagnosis.

The diagnosis which requires most attention is that between chronic bronchitis and tubercular phthisis. It is in some cases easy, in others very obscure; and sometimes the former disease, in its advanced stage, cannot be distinguished from the latter; and besides, as before observed, they are often complicated.

Early in the disease, the absence of pain during inspiration, the capability of resting on either side in bed, (when there is no abdominal disease,) the wheezing noise in respiration, the leaden colour of the lips, and the pallidity of the countenance, the appearance of the sputa, consisting almost entirely of mucus occasionally streaked with blood, are symptoms sufficiently well marked to distinguish chronic inflammation of the bronchia from tubercular phthisis.

In many examples the disease can be traced to the operation of cold, which at first brought on simple catarrh; and it still retains symptoms which denote its catarrhal origin in a sufficient degree to distinguish it from the incipient stage of tubercular phthisis. As the disease advances the affection becomes more obscure, and the symptoms which are thought to point out tubercular consumption often become intermingled with those of chronic bronchitis. The peculiar pallidity of countenance, however, still continues, and there is in the

majority of cases no pain in the chest; and if it come on, it is diffused over the whole of the chest. The dyspnœa is not so great on exertion as in tubercular phthisis, and the patient can take a much larger volume of air into the lungs. The dyspnœa too is always relieved by expectoration, which does not happen in phthisis: there is a peculiar sensation of stuffing complained of in the former, which does not occur in the latter affection. The expectoration is various, but there is always a considerable quantity of mucus mixed with the pus-like matter. The quantity of matter expectorated in this disease is much greater than in tubercular or apostematous consumption, except at the time a vomica gives way, when large quantities are brought up; but this excessive discharge does not continue long in the latter disease, whereas in chronic bronchitis we often see a pint or a pint and half of matter expectorated during the night, and that for a long period together. We have not a short tickling cough in bronchitis; it is deep and sonorous. The paroxysms of hectic fever are much less regular in chronic bronchitis than in tubercular phthisis. The perspirations are partial, confined, perhaps, to the breast and upper extremities. The emaciation too is, generally speaking, less in inflammation of the mucous membrane than in tubercular phthisis, though we do meet with cases in which the emaciation is as great in the former as in the latter affection. When the pulmonic symptoms have

arisen from a diseased liver, it is a strong presumption that the seat of the disease is in the bronchial membrane; for in almost all cases of this description the mucous membrane is the part affected. When this combination occurs, the spirits are always depressed; and in addition to the usual pulmonic symptoms, we have in this form of the disease a painful and distended epigastrium, unnatural stools, and disordered digestion. The mouth is dry in a morning, and the tongue loaded. The fits of coughing are constantly excited when the stomach is overloaded, and are apt to come on when the patient is lying on either side in bed.

If chronic have succeeded to acute bronchitis, the emaciation is sometimes so great, the hectic fever so complete, and the matter expectorated so purulent, that a person seeing the disease after it is formed will often be inclined to believe that he has to treat an ordinary phthisis; but an attention to the history of such cases will frequently lead him to distinguish the former affection from the latter, and the event will usually justify his distinction.

The greatest advantage arises from tracing these affections to their origin. We sometimes find that the symptoms have come on soon after the disappearance of a cutaneous affection, which should always lead us to suspect that the bronchial membrane is diseased. Notwithstanding all our attention to the occasional cause by which the disease is

induced, to the habit of the patient, and to the modification of the symptoms, in the latter stage of the disease it often becomes impossible to distinguish it from tubercular consumption. The history of the disease is then our best guide.

It often happens that tubercles do form when chronic bronchitis has existed long, or the lungs become very much more solid than natural; but patients sometimes die without any perceptible disease taking place in the substance of the lungs. There are no symptoms towards the close of the disease which can inform us whether the lungs are or are not tuberculated.

In some varieties of chronic bronchitis there is no difficulty in making the distinction between that disease and tubercular phthisis. Those in whom the disease originates from the inhalation of irritating substances, often continue to cough much, and expectorate copiously for years, without losing any flesh, and, excepting when the affection is more than usually severe, do not complain much of dyspnœa. Besides the absence of these symptoms, so characteristic of tubercular consumption, the peculiar pallidity of the countenance, combined with a slightly livid tinge on the lips, cannot fail to point out the distinction between the former and the latter disease.

In advanced life, when the chronic bronchial inflammation assumes the form of tussis senilis, we

never find any difficulty in the diagnosis between this affection and pulmonary consumption.

Chronic bronchitis may be distinguished from whooping cough by the absence of that peculiar cough which attends the latter disease. Neither does the cough in the former come on so decidedly in fits as in the latter. The dyspnœa is constant in bronchitis, whereas in whooping cough there is usually entire freedom from it between the fits. It is only in the more dangerous cases of this disease that there is any considerable oppression of the breathing in the interval between the fits; and whenever this occurs we have reason to dread that a considerable degree of inflammation has taken place in the mucous membrane of the lungs; since dissection shows us, that in all fatal cases in which there is much dyspnœa, the effects of inflammation are always to be seen in the bronchia.

The history of the case, and of its mode of attack, independently of any other circumstances, almost always enables us to make a distinction between chronic bronchitis and whooping cough. When the former has come on slowly in combination with abdominal disease, has succeeded to an acute attack, or has been produced by mechanical irritation, there can be no difficulty in discriminating between the two affections. But it sometimes happens that whooping cough succeeds to measles; in which case some doubt may arise as

to the nature of the affection. If, however, there be much oppression of breathing, or general fever, we may always infer that inflammatory action has taken place in the mucous membrane of the lungs.

With regard to the distinction of chronic bronchitis from asthma, it may be observed, that the periodical exacerbation so constantly occurring in the latter disease never takes place in the former; that the pulse is considerably affected in chronic bronchitis, but in asthma it often continues in a natural state, even during the fits. The frequent cough, with copious purulent expectoration and dyspnœa, which uniformly attend slow inflammation of the bronchia, are rarely met with in the same degree in asthma. It is true that during the fits there is considerable dyspnœa, straitness across the chest, and some cough, which remit when an expectoration of mucus comes on. But these differ widely from the dyspnœa, frequent cough, and copious purulent expectoration, which occur in the former disease.

Prognosis.

This disease is of various event, which, however, may commonly be foreseen by attending to the previous history and the state of the symptoms.

If it have arisen from some catarrhal affection, and there be not much emaciation, nor a decidedly formed hectic, it often terminates favourably, although the expectoration may be pus-like and

copious, and a considerable degree of dyspnœa with frequent cough may attend. On the other hand, if the patient be much emaciated, and hectic fever have come on, there is always great danger of a fatal event; for it is more than probable that the disease has extended to the substance of the lungs, and that they are either become more solid than natural, or that tubercles have formed.

When the disease has begun with the formidable symptoms of acute bronchitis, we more frequently see patients recover from a state of emaciation, accompanied with dyspnœa, cough, and copious purulent expectoration, than when these symptoms have crept on slowly without any such attack.

Patients in whom the attack has arisen from mechanical irritation of the bronchia, often recover from a very dangerous state, if the irritation which produced the disease be removed. Those of phthisical habit are in the greatest danger from this disease; and in them a slight attack is more to be feared than a severe one in those who are not predisposed to consumption. If this disease come upon persons previously much debilitated, it is attended with great danger.

The more purulent the expectoration, the greater the danger; but if a large proportion of mucus be present in the expectorated matter, we may look to a favourable issue, although the quantity spit up be considerable.

When chronic bronchitis is combined with some

abdominal disease, and is attended with emaciation, fever, severe cough, and copious pus-like expectoration, it usually proves fatal : but often at an earlier period of the attack, if the abdominal disease be relieved, the pectoral symptoms give way, and the patient's life is saved.

The more severe the abdominal affection, the greater is the danger of a fatal issue ; and if it cannot be removed, the pulmonic symptoms generally prove fatal. Thus, if ulceration of the stomach, or chronic disease of the peritonæum and mesenteric glands, be combined with chronic bronchitis, the prognosis is very bad : whereas if hepatic disease, removable by mercurial remedies, have caused the inflammation of the bronchial membrane, we can often remove the pectoral symptoms by curing the hepatic affection.

On the Treatment of Chronic Bronchitis.

From the history of chronic bronchitis, it appears that great diversity in its symptoms occurs, according to the causes from which it originates, the constitution of the patient, and the diseases complicated with it. The treatment differs in some particulars in these several varieties, but it should be chiefly directed to remove inflammation of the mucous membrane. The means employed for this purpose are various. Some act by directly enfeebling the force of the circulation ; some moderate excitement by re-establishing the secretions through-

out the system; others act on parts in the neighbourhood of that which is diseased; and a few are directly applied to the inflamed membrane.

Blood-letting comes under the first head. Pulmonary inflammations, above all other maladies, are relieved by this powerful remedy; but when the disease has existed long in the bronchial membrane, a considerable change takes place in its structure, and general debility always occurs, so that we cannot in all cases employ it with success.

If this disease present itself under the form of chronic cough in persons not very much advanced in life, whose constitution is strong, and the pulse is full, inclined to hardness, and frequent, we may always detract a small quantity of blood. But large blood-lettings are improper; for the strength of the patient is so much reduced, that the disease of the mucous membrane will be rather increased than diminished by profuse evacuations. Even in the cases above alluded to, it is, perhaps, better to employ local than general blood-letting; for the former can be more frequently repeated, and the vessels of the lungs are thus unloaded at less expense to the system.

When catarrh has existed for a considerable length of time in young persons, and has produced symptoms resembling the first stage of tubercular phthisis, it will not be proper to employ venesection; for the system is already much exhausted by the copious secretion from the mucous mem-

brane, and from the long continuance of the irritation. In these cases recovery is very slow; and it is by the conjoined operation of remedies that we are to expect relief, rather than from the sudden operation of depletions. Patience is of the utmost importance in all chronic diseases. We cannot expect a speedy resolution when the mucous membrane is much altered in structure by the long continuance of inflammatory action. In these examples, if the pulse be hard and rather full, and the cough tight, we always derive temporary advantage from local blood-letting, which may frequently be repeated. A considerable time must necessarily elapse ere a disease, which has existed so long, can be materially relieved.

We sometimes, however, meet with cases of chronic bronchitis in which one copious venesection is of great benefit. This especially occurs where the disease has been kept up through a period of years, in consequence of the occupation of the patient constantly exposing him to the exciting causes. Under such circumstances it occasionally happens, that the constant obstruction to the free circulation causes enlargement of the right side of the heart and a general plethora of the venous system. The patient's breathing becomes very laborious, the face and hands purple, and every symptom indicates an obstructed circulation through the lungs. One large venesection sometimes removes all the urgent symptoms: and

by discontinuing the employment which has given rise to the affection, and by the application of the remedies to be afterwards mentioned, such patients are generally restored to a comparatively good state of health; but the resumption of their accustomed occupations invariably brings a return of their complaints. The leather dressers and the workers in the china manufactories of this town are very frequently affected in this manner. They are relieved for a time by medicine; but the disease always destroys them if they do not quit their employment. When cases of acute bronchitis terminate in the chronic disease, evacuations have generally been carried as far as possible in the early stage of the affection; so that in those cases of acute disease which end in symptoms resembling tubercular phthisis, neither general nor local blood-letting can usually be employed. In some examples, however, where the early symptoms have been neglected, we may have recourse to frequent local blood-letting.

When chronic bronchitis arises from some abdominal affection, the abstraction of blood must in some degree be regulated by the effects produced on the system by the primary disease.

In some cases of disease of the stomach, or other abdominal viscera, the patient is much reduced before the bronchial membrane is at all affected. In these, from the exhaustion previously produced, it would be prejudicial to take away blood; but when chronic bronchitis is called into

action by hepatic affection, it often begins early, and the constitution of the patient is not exhausted : blood-letting may therefore, if necessary, be resorted to in such instances. We must not, however, usually advise venesection, but rely on local blood-letting, which is generally sufficient to remove the inflammatory action ; for in chronic disease the patient should never lose an ounce of blood unnecessarily, because we do not know how long the symptoms may continue, or how great debility they may produce. When inflammation of the mucous membrane of the bronchia is combined with hepatic affection, several local blood-lettings are generally necessary. The repetition of them must be governed by the relief obtained, by the obstinacy of the cough, and by the pain in the epigastric region.

After the force of the circulation has been weakened, vesicatories and rubefacients may be applied to the chest ; but it is dangerous to employ them early when the inflammatory symptoms are strongly marked ; for by doing so, if the system be readily excited, we are sometimes again compelled to adopt antiphlogistic measures. When inflammation of the mucous membrane does not cause a very hard pulse, and the patient does not appear readily excited, blisters may be applied immediately after the leeches have ceased to bleed. They generally relieve the cough, and, by the irri-

tation they occasion on the skin, seem to lessen the superficial inflammation going on in the mucous membrane. By their action also the purulent secretion from the internal surface of the lungs is sometimes converted into the natural mucus of the part.

If the disease be obstinate, and put on that form which so much resembles tubercular phthisis, although the blisters at the time of their application relieve the cough and dyspnœa, yet these symptoms often return, and call for the frequent repetition of this remedy. In such cases, if the patient be much debilitated, it is better not to persist in their use, for more beneficial effects are then produced by inserting a seton, or by applying a caustic to the chest. Some subjects cannot support the continued irritation of the nerves of the part which is thus occasioned, and we are then obliged to dispense with its use.

Emetics have often been recommended in that variety of chronic bronchitis which appears in old people, and is denominated *tussis senilis*. The cough and dyspnœa are in such cases much aggravated by the accumulation of redundant secretion in the trachea, bronchia, and air cells, which, by the action of vomiting, is frequently thrown up. Whenever, therefore, the lungs appear loaded with phlegm to any great degree, they may be relieved by an emetic : but this practice does not appear to have

much effect in forwarding a radical cure. In other varieties of chronic bronchitis emetics are not frequently employed.

The digitalis purpurea does not seem applicable to all cases of chronic bronchial inflammation; but when it assumes the form of catarrhal phthisis, the foxglove, by diminishing the velocity of the pulse, and by promoting a free discharge of urine, often relieves the breast. It is highly beneficial in all those examples in which bronchial inflammation has a tendency to terminate in dropsy, its powerful diuretic effects preventing the accumulation of the exhaled fluids; but when the disease is attended with much prostration of strength, digitalis, even if indicated, must be exhibited with great caution.

The powder of the bulbs of the scilla maritima is often serviceable when bronchitis assumes the character of chronic cough. The author has generally exhibited this powder in conjunction with ammoniacum, as directed in the compound squill pill of the London Pharmacopœia; and in old people of phlegmatic habits, when there is not much fever, he has found this a very useful expectorant.

The tincture of meadow saffron appears a very promising remedy in chronic bronchitis, and certainly possesses very remarkable powers. It allays the cough, promotes the flow of urine, and keeps up a regular alvine discharge. It can be given much more generally than squills, because it does

not produce that feverishness which results from the use of the latter remedy, and can therefore be employed where there is considerable fever; for, from the power it possesses over the secretions, this medicine tends to relieve fever. The dose generally prescribed by the author is twenty drops three times a day. In some cases this must be diminished on account of its action on the bowels, severe diarrhœa being occasionally brought on by its use. Sometimes the patient is not affected by twenty drops: if this should happen, the dose may be gradually increased, until the bowels, the skin, or the kidneys, are acted upon. Patients rarely bear more than thirty drops three times a day without being a good deal purged, which is not to be desired in prolonged cases of this disease. If there be much quickness of the pulse, the author generally combines eight or ten drops of the tincture of foxglove with that of the meadow saffron; from which combination the cough is often relieved, and the quickness of the pulse is diminished.

Some of the vegetable balsams have by two late writers, Drs. Duncan and Armstrong, been highly extolled in chronic inflammation of the bronchial membrane. The latter thinks that the copaiba deserves to be conspicuously placed amongst the internal medicines, as it seems to exert a specific influence on the mucous membrane. It has failed with the author in producing so much benefit as he was led to hope from Dr. Armstrong's report.

Whenever there is much fever, it appears to be increased by this remedy, and it does not always allay the cough, or alter the expectoration. It frequently disagrees with the stomach when given in sufficient doses to benefit the pectoral symptoms, and sometimes a diarrhœa comes on under its use. Occasionally it produces all these troublesome effects without relieving the cough. But this balsam certainly seems to exert an influence on the mucous membrane, although, perhaps, not a much greater one than the squills or meadow saffron. Further inquiry, however, may determine in what respects it is superior and in what inferior to these remedies. In the mean time Dr. Armstrong has done considerable service by bringing the copaiba into general notice.

In several obstinate cases of chronic bronchitis in the author's practice, very beneficial results have occurred from the combination of cicuta with ipecacuanha powder. A pill, containing four grains of extract of hemlock and one of powdered ipecacuanha, taken three times in the day, often allays the cough, and produces a more healthy expectoration.

There are some states of the system during the progress of chronic bronchitis in which cinchona may be useful; chiefly in those instances that succeed to acute bronchitis, where the debility brought on by the acute attack is very considerable. In such examples, if the dyspnœa be not increased,

the benefits arising from its exhibition are sometimes very apparent. The profuse perspirations and other discharges are not only restrained by this remedy, but it occasionally appears to alter the secretion from the mucous membrane of the lungs, and thus brings about a more healthy condition of that membrane, by invigorating its blood vessels and restoring their natural tone. In these cases it may be combined with diluted sulphuric acid, which also tends to restrain the colliquative sweats that so often accompany this disease.

The use of mercury in some varieties of chronic bronchitis greatly assists the operation of other remedies ; but it must be given in such a way as to produce the least possible debility of the system. Whenever chronic inflammation of the bronchia is combined with hepatic affection, very small doses of calomel or blue pill should be conjoined with the other remedies, and continue till the gums become slightly red, or till the appearance of the dejection is more natural, and the tenderness in the epigastric region is diminished. For the purpose of lessening the quantity of mercury necessary to be given in these cases, Dr. Philip has, in his observations " on a Species of Pulmonary Consumption," strongly recommended dandelion to be combined with it. This remedy must be given in large doses ; and if, when so employed, the stomach bear it well, the flow of bile is promoted, and a healthy action of the bowels is kept up.

If chronic bronchitis be combined with slow inflammation of the peritonæum and mesenteric glands, mercury may be carefully administered; but the disease generally resists this as well as every other remedy.

The great advantage derived from calomel in croup would lead us, from analogy, to adopt it very constantly in inflammation of the bronchial membrane. But the debility produced by this disease, when of a chronic nature, prevents the free use of a remedy whose debilitating effects on the constitution are so strongly marked. Calomel, therefore, is chiefly used when the disease occurs in conjunction with some abdominal affection. There are cases, however, in which it is advantageous in chronic bronchitis uncombined with any disease in the abdomen. These sometimes occur after measles, when the shrillness of the voice indicates considerable affection of the mucous membrane lining the trachea.

Opium can only be regarded as a palliative, and from its stimulating effects is often prejudicial as long as there is much fever. In the chronic catarrh of people advanced in life its use sometimes is unavoidable. In such cases a full dose may be given at bed time, which will procure some rest in the early part of the night, before there is much accumulation in the bronchia and air cells; but we must be very cautious in its use, as by preventing expectoration it sometimes proves fatal.

In the latter stages of chronic bronchitis, where the quantity of matter expectorated is very large, and the cough very troublesome, there is no remedy so powerful in allaying the uncomfortable irritation about the glottis as opium. But valuable as this remedy is, it is not always free from inconvenience or danger, and consequently other remedies of this class have been proposed as substitutes for it.

Dr. Duncan has strongly recommended lactucarium when opium cannot be given. He says, "Of all the medicines which I have employed for alleviating cough in phthisis, and indeed as a sedative in many other diseases, next to opium, I have found no article so beneficial as that substance which some have lately denominated lettuce opium, and which I termed lactucarium*."

Independently of the internal remedies which are administered in diseases of the lungs, certain modes of cure have been applauded in which remedies are applied to the part affected.

The inhalation of different articles under the form of vapour has thus been a favourite practice with some writers on pulmonary consumption. If there be any affections of the lungs in which this practice is beneficial, it appears to be those in which the mucous membrane is the principal seat

* Observations on Pulmonary Consumption. By A. Duncan, senior, M.D. 2d edition, p. 162.

of the disease ; because it is in them only that the remedies can be topically applied. The vapour of tar is the only one of them that the author has ever made extensive trial of. This came supported by such apparently strong evidence as a cure of pulmonary consumption, that almost every medical man felt inclined to give it a fair chance in this hitherto incurable malady. Not one instance has occurred in the author's practice of even temporary relief in tubercular consumption by the inhalation of this vapour : indeed, it has appeared in some examples of this kind to cause a very tiresome irritation in the glottis, which has increased the cough. This has not been so much the case in chronic bronchitis ; in this disease it seems to assist other remedies in restoring the mucous membrane to its healthy secretion ; and in some very obstinate cases the inhalation alone has appeared to remove the diseased action in the mucous membrane of the lungs. In other instances the inflammation has been aggravated and rendered more acute by it. From the author's experience of this remedy, it appears that when the habit of body is irritable, and the inflammation at all active, the symptoms are increased by its use ; but if the disease have been long in a chronic state, and the habit of body be not irritable, relief follows its application.

It will be in vain that the above remedies are applied, if we do not, at the same time, attend to regimen.

The diet in chronic bronchitis must never be of the stimulating kind ; but it is not generally necessary to recommend a spare and refrigerant one. In the early stages of the disease, when there is considerable disposition to general inflammatory action, it will be right to confine the patient altogether to milk and vegetables. In its advanced stage, when considerable debility has come on, and more especially if it have supervened on an acute attack, a more nutritious diet may be enjoined ; for the system, in consequence of the long continuance of the disease, requires to be recruited and supported. Cordial and stimulating drinks are always improper, as, from their stimulating powers on the nerves of the stomach, they increase the velocity of circulation. As much attention is requisite to the air which the patient breathes as to the aliment he feeds upon. There is no disease to which the maxim of Celsus, "*Pessimus ægro cœlum est, quod ægrum fecit,*" is more applicable than the present. Obstinate cases of bronchitis, which have long resisted all medical aid, are often cured by a change of air : even the removal to a situation in the immediate neighbourhood seems often to be productive of surprising effects. When the patient resides in a town, he should always be removed from it, if the time of year be such as to admit of exercise in the country.

Where the disease has several times returned, and is easily brought on by vicissitudes of tempera-

ture, a removal to a warmer and more steady climate is proper. Under these circumstances a pure and dry air should be selected, as a hot situation conjoined with moisture is always to be avoided. The sea air during the summer months, in those who live in an inland situation in this country, sometimes invigorates the constitution, and restores the tone of the vessels on the bronchial surface, so as to prevent a return of the disease, where former attacks have left a susceptibility to inflammatory action.

The clothing must of course vary according to the season and situation. The patient should endeavour to obtain moderate but not oppressive warmth. In this climate, flannel next the skin during the spring and winter months, by slightly stimulating its vessels, sustains the circulation on the surface, and thus tends to relieve chronic inflammatory diseases of the pulmonic system.

It is quite as necessary to attend to the alvine discharge: the bowels should be kept open; but purging is not beneficial, a lax state of the body being all that is required.

Exercise, where the strength will admit of it, is of the utmost importance. Of the different modes of exercise, that may be chosen in almost every instance which is most congenial to the feelings of the patient. Walking is often too fatiguing, and apt to hurry the breathing. In such cases either carriage or horse exercise may be substituted. In

directing exercise in the open air, we should always take care that the weather is not such as to give cold, which never fails to increase the disease. When we are obliged to keep the patient in the house, the swing invented by Dr. Carmichael Smith may be employed with advantage.

The cases which illustrate the several varieties of chronic bronchitis, whose history has been above given, may now be detailed.

CASE I.

Chronic Bronchitis succeeding to Catarrh.

S. T., aged twenty-two, was admitted into the Worcester Infirmary on the 20th of December, 1813. She was of a spare habit, fair complexion, and lax fibre. About a month before admission she took cold, which brought on coryza, cough, and hoarseness. In a week after the attack the expectoration became copious, and slightly streaked with blood, and she was much distressed with a sense of straitness across the chest.

On the day of admission the hoarseness continued, but the breathing was not much oppressed. The cough was troublesome, and she expectorated a thick matter, consisting of a large portion of mucus mixed with some pus. The pulse was 90, the face flushed, and the respiration was accompanied with a slight wheezing noise. She was

emaciated ; she could lie on either side in bed, and had no fixed pain in the chest, but complained of a general sense of tightness there.

A blister was applied to the chest. She took ten drops of tincture of digitalis three times a day, and some sulphate of magnesia occasionally.

The breath soon became more affected, and she gradually emaciated. The cough increased in violence. The expectoration was more copious and purulent, contained less mucus, and was tinged with a small quantity of blood. A flush generally appeared on the cheeks in the evening, and during the night the skin became damp. The pulse was quicker. She had still no pain in the chest ; but the hoarseness continued, and some tightness was felt under the sternum. There was also some degree of wheezing.

A perpetual blister was applied to the chest, and fifteen drops of diluted sulphuric acid were added to each dose of the tincture of digitalis.

In two months after admission the disease had assumed a still more formidable aspect. She had regular paroxysms of hectic fever. The cough was incessant, and the expectoration exceedingly copious, and mixed with blood.

She died in the middle of March.

Dissection.

The lungs did not collapse on opening the thorax. There were some old adhesions between

the pleuræ, but none of recent occurrence. When an incision was made into the lungs, a considerable quantity of blood mixed with a frothy pus-like matter escaped. No tubercles could be found in their substance, nor was there any abscess. Their structure, however, was harder than natural, and they were generally darker coloured. Some parts of the lungs were as hard and as solid as liver, and much resembled it in appearance. The trachea being divided, was found full of pus-like fluid, with an admixture of mucus and blood. The bronchia also were full of a similar fluid. The mucous membrane was so vascular as to appear like a network of vessels. Several superficial ulcers were found in the larger ramifications of the bronchia.

The heart was enlarged. The other viscera were healthy.

Observations.

The symptoms in the early stage of this affection, when the patient was admitted into the Infirmary, were readily distinguishable from those of tubercular phthisis. The slight degree of dyspnœa, the absence of all pain, and the comparative slowness of the pulse, were sufficiently obvious distinctions from that disease: yet as the disease approached its termination the symptoms completely resembled those of tubercular consumption. Dissection, however, did not show any tubercles in the substance of the lungs. The principal disease was

seated in the mucous membrane lining the bronchia, which was thickened, ulcerated, and highly vascular. The inflammation had extended into the substance of the lungs, as they every where felt harder and were of a darker colour than natural, and in some places their structure resembled that of liver.

CASE II.

Acute terminating in Chronic Bronchitis.

G. I., aged fifteen, a delicate girl, residing in a wretched habitation in one of the closes in the Grass Market, Edinburgh, was visited by the author on the 16th of May, 1817. She had been ill with fever some days. She was affected with violent headach, general pain in the back and limbs, much heat of skin, a dry and furred tongue, and constipated bowels.

She was bled to the extent of ten ounces from the arm, had six leeches applied to the temples, and took some cathartic medicine. By these remedies she was much relieved, and on the 20th appeared fast approaching to convalescence.

Being considered safe from the febrile attack, she was not visited again for some days. At the next visit she had severe cough, laborious respiration, a quick and hard pulse, a loaded tongue, and great heat of skin. She was bled from the arm,

had a blister applied to the breast, and took one-eighth of a grain of tartar emetic every four hours. The breathing and cough were much relieved, but she was considerably weakened; and as her poverty was so great that she had scarcely the necessaries of life, she was exposed to great hardships.

Towards the middle of June the disease by no means bore a favourable appearance. The cough was very troublesome, and was accompanied with a copious expectoration, composed of pus and mucus, and sometimes tinged with blood. She constantly spoke of a distressing tightness across the chest, and visibly lost flesh and strength. The pulse was quick, and the face frequently flushed.

She had leeches and a blister applied to the breast, and the discharge from the latter was kept up for a considerable time by means of savine ointment. She also took ten drops of tincture of digitalis three times a day.

At the end of June she was weaker and more emaciated. The cough was more troublesome. The expectoration was increased in quantity, and more purulent. Partial perspirations frequently broke out in the night. She did not complain of any pain in the breast, and could lie on either side in bed.

These alarming symptoms rapidly increased. She was reduced to the last stage of debility, and the cough harassed her. She expectorated copiously,

and the matter had all the characters of pus. The night sweats were very profuse. She died in the beginning of July.

Dissection.

There were no tubercles in the substance of the lungs. The pleura too was quite healthy. The lungs did not collapse; and when an incision was made into them a frothy purulent matter escaped. They were deeper coloured, harder, and heavier than natural. The trachea was full of a pus-like matter, mixed with tenacious mucus; and the bronchia and air cells were filled with a similar matter. The mucous membrane was much diseased; it appeared thickened, was highly vascular, and small ulcers were found in several parts of it. The heart and abdominal viscera were quite healthy.

Observations.

The symptoms of this girl's disease, in its last stage, so exactly resembled those which arise from tubercular consumption, that the lungs were thought to be completely disorganized. At an early stage of the disease there were, no doubt, ample means of distinguishing this chronic inflammation of the bronchial membrane, and slight thickening of the substance of the lungs, from a tubercular state of that organ; but as the disease advanced, the symptoms proper to the former affection were lost in those that were supposed to denote either an abscess

or tubercles in the lungs. The unfavourable issue of this case is principally attributable to the hardships which this girl endured. Had it not been for the perpetual vicissitudes of temperature in her wretched habitation, and the almost entire want of the necessaries of life, there is reason to believe she might have recovered.

CASE III.

Chronic Bronchitis, produced by Fever, occasioning Symptoms resembling Tubercular Phthisis, and terminating favourably.

J. M., aged twenty-eight, a servant maid, with fair complexion and light hair, was received into the Edinburgh Infirmary on the 10th of June, 1817. She had been ill with fever ten days. When admitted she complained chiefly of pain in the head, great heat of skin, and frequent vomiting. By cupping, and a calomel bolus, the pain in the head subsided; but a cough came on, with laborious breathing, and some pain and tightness across the breast, accompanied with vomiting.

She had a blister applied to the chest, and took cooling drinks.

By the 15th of June, the vomiting, cough, and dyspnœa, were much relieved, and she began to expectorate pretty freely. On that evening she had a considerable degree of pain in the right side, accompanied with a bitter taste in the mouth, and

with vomiting. These symptoms were slightly relieved by blistering and the effervescing draught; but they returned on the 19th, and the dejections became of a green colour. She took two grains of calomel, with one grain of opium, three times a day.

These pills were continued for three days, when the pain in the right side was quite gone, but the cough was not at all abated: indeed the cough at this time became more troublesome, and was attended with an expectoration of different colours. The pulse became quicker.

On the 23d the expectoration was called purulent, and tinged with blood. Pulse 104. On the 25th she perspired much during the night; for which she was directed a mixture of diluted sulphuric acid three times a day. Throughout the remainder of the month of June she gradually lost her flesh, and had profuse night sweats. The pulse became very quick. She had a harassing cough, with purulent expectoration, which was not at all checked by tincture of digitalis and sulphuric acid. She slept so ill at this time, that she took laudanum, which seemed to constipate the body: a drachm of tincture of hyosciamus was therefore substituted.

The beginning of the month of July brought no alleviation to the patient. She coughed very much, particularly in the morning, expectorated a large quantity of purulent fluid, and sweat profusely.

At length she was reduced to the lowest state of emaciation. About the 9th of July these perilous symptoms began to subside, and gradually abated during the whole of that month. At that time she only took a mixture of sulphuric acid and the tincture of hyosciamus as a nightly anodyne. She left the hospital free from cough in the beginning of August, and went into the country for change of air. By the middle of September she had quite recovered.

Observations.

Happily the recovery of the patient in this case prevented our ascertaining, by anatomical investigation, the nature of this disease; but the perfect restoration of health in so short a period renders it quite certain that the substance of the lungs was not much diseased: which circumstance, taken in conjunction with the close resemblance of the symptoms to those of G. J., in which examination after death demonstrated that chronic inflammation of the bronchial membrane had produced the symptoms of tubercular phthisis, seem to justify the conclusion that a similar diseased action in the mucous membrane of the lungs took place also in that of J. M.

CASE IV.

Rubeola terminating in Chronic Bronchitis.

April 20, 1819.—M. P., aged three. This little girl was severely affected with the measles in the middle of the month of March. The parents said that the cough had not left her since the subsidence of the eruption. The author was requested to visit her on the 20th of April, on account of the severity of the cough, which was accompanied with a copious pus-like expectoration, sometimes tinged with blood. She was much emaciated, and her head was bedewed with perspiration during the night. Pulse quick, 120. Breathing oppressed.

A blister was applied to the chest, and she took one grain of calomel every night.

In a fortnight the cough had nearly left her, and by persisting in the alterative plan for a month she completely recovered.

Observations.

Although the symptoms so much resembled tubercular consumption, a more favourable prognosis was formed in this case, because it appeared probable that there was some disease of the mucous membrane of the lungs consequent to measles, which might produce all the symptoms above mentioned. The calomel was given in the first instance on account of the irregularity of the bowels; but as

the pulmonic symptoms seemed to diminish under its use, it was continued until the patient finally recovered.

CASE V.

*Rubeola producing Chronic Bronchitis and
hardening of the Lungs.*

J. P., aged twenty, of fair complexion and light hair, was made an out-patient of the Worcester Infirmary on the 20th of November, 1819. He was affected with pain and tenderness in the right hypochondrium. He had a very bad cough, which was harassing during the night and when he first awoke in the morning. His breathing was much oppressed, and was accompanied with a wheezing noise. His face was pallid. The emaciation, though not to any great degree, was evident. He did not sweat at night. He expectorated a large quantity of matter, which resembled pus blended with mucus. Pulse hard, 90. Tongue loaded. Bowels irregular; sometimes constipated, at others lax. Three months before he applied for relief he had a severe attack of rubeola, to which his complaints succeeded. Previously to that time he had enjoyed very good health.

Six ounces of blood were taken from the right side by the cupping glass, and a blister was afterwards applied. He was directed to take a pill, containing one grain of blue pill and four of extract

of hemlock, twice a day; and fifteen drops of tincture of meadow saffron, with eight of tincture of digitalis, three times a day.

On the 24th the pain in the right side had subsided, but the cough and expectoration continued as before.

On the 4th of December, as his complaints were not better, he was admitted an in-patient. The pain had left the side. He took a full inspiration without complaining of any uneasiness. His nights were very restless, and he sweat always towards morning. Pulse hard, 96. Belly regular.

He was bled to eight ounces. The blister to the chest was repeated. He omitted the blue pill, and continued the other medicines, increasing the dose of extract of hemlock to five grains.

He continued with similar symptoms till the 2d of January. The dyspnœa was then somewhat relieved. The countenance was still pallid. The cough was unabated. The expectoration very copious, consisting of tenacious mucus mixed with pus. He had lost flesh since his admission. His nights were restless, and he sweat towards morning. A blister was again applied to the chest, and a constant discharge directed to be kept up.

He took a draught, containing half a drachm of balsam of copaiba, three times a day, and omitted other medicines.

The medicine did not make him sick. In a few days the expectoration was lessened; but the

cough was not diminished, though the dyspnœa was relieved.

On the 14th an exanthematous eruption appeared on the body. The cough and expectoration seemed in some degree relieved; but the wheezing noise in breathing, which had continued ever since his admission, was still heard, and he sweat very much during the night. Pulse hard, 96. Belly regular.

He continued the copaiba.

The eruption disappeared on the 20th. The cough and expectoration returned in as great a degree as before, and the nights were extremely restless. He continued the mixture.

In the beginning of the month of February the symptoms were not at all relieved. A quantity of blood was mixed with the expectoration, and his strength failed him. The emaciation was not considerable. The night sweats were very profuse. The face was still pallid, and a flush was very rarely observed on it. The wheezing noise in breathing continued.

He omitted the copaiba mixture, and took eight drops of tincture of digitalis and fifteen of diluted sulphuric acid three times a day. The chest was still blistered.

Throughout the whole of February he got weaker. The cough and expectoration increased. He sweat profusely at night. His face, however, was now flushed in the evening, but retained its pallid appearance in the morning. The breathing was

still accompanied with a wheezing noise. The emaciation was not very great.

Finding himself get worse, towards the end of February he drank a large quantity of rum, to cure his cough. In a few days the breathing became very much more oppressed, and the cough was increased. He died on the 2d of March.

Dissection.

On opening the thorax the lungs did not collapse. The right lung was closely adherent to the ribs, and was with difficulty separated from them; but none of the adhesions appeared of very recent formation. The left lung was also slightly adherent. The right lung, when an incision was made into it, bore a close resemblance to the liver, but it was harder than that organ. No air or fluid escaped when the incision was made. There were only a few small tubercles found in it, most of which had not suppurated. But a few of the bronchial cells could be traced, owing to the general thickening of the structure of the lungs. In those which were exposed, the mucous membrane was greatly diseased. It was much thickened, and of a deep scarlet colour. In some parts minute ulcers were visible.

The general substance of the left lung was not hardened. In some parts its structure was not at all thickened, in others slightly so. One small portion was nearly as hard as the left lung. There were a few tubercles. A very small one had suppurated.

When an incision was made into this lung, a large quantity of frothy mucus, mixed with pus, escaped. On tracing the mucous membrane which lined the bronchial cells, it was found of a deep scarlet colour, much thickened, and in many parts of it small ulcers were detected. The bronchial glands were much enlarged. The heart and pericardium were united together. The structure of the heart was healthy.

The liver was larger than natural, of a light colour, and approaching the nutmeg appearance. Its right lobe was adhering to the peritonæum which lined the ribs.

The surface of the omentum was granulated, and it adhered to the intestines.

The peritonæum in general bore marks of a chronic disease. There were several small tubercles on it. The intestines were united together, and their peritonæal covering was granulated.

The mesenteric glands were enlarged. All the other viscera were healthy.

Observations.

The symptoms and the history of this case, when the patient was admitted, readily distinguished it from tubercular consumption. The slowness of the pulse, the pallidity of the countenance, the wheezing noise in breathing, and the freedom from pain in inspiration, were all strong evidence that he was not affected with tubercular consumption: to which, when the circumstance was added of his

having enjoyed perfect health up to the period of the attack of rubeola, little doubt could remain on the subject. Towards the termination of the disease the symptoms approached more nearly to those of tubercular consumption; but even to the last the peculiar pallidity of the countenance continued, and the degree of emaciation was never very great. It appears from the state in which the right lung was found, that its air cells were still capable of receiving air, had not the sudden increase of inflammation, which seemed to take place a few days before death, produced so copious a secretion into the bronchia as to cause suffocation: and it is therefore probable that the life of this patient might have been preserved some time, had not the chronic inflammation of the mucous membrane of the right lung been rendered active by the imprudent use of spirits.

The great diversity of structure in the two lungs appeared to arise from the same disease in different stages of its progress. In the left lung the mucous membrane was principally affected; it was thickened and ulcerated; but in some parts the chronic inflammatory action had extended to the substance of the lungs, coagulable lymph was deposited, and the substance of the lung was rendered solid. The whole of the right lung was converted into a hard substance, and the mucous membrane was disorganized. The inflammation appears to have extended at an earlier period

from the mucous membrane to the substance of the organ in this than in the left lung. The few tubercles observed probably existed from the commencement of the disease. The symptoms, when the patient was admitted, indicated some affection of the abdominal viscera; but the pain and tenderness of the right hypochondrium subsided after the cupping and application of the first blister, and there were no symptoms, after that time, which could point out the extensive mischief which was going on in the peritonæum.

CASE VI.

Chronic Bronchitis coming on after the Disappearance of a Pustular Eruption.

Mrs. D., aged forty, of a slender form, was subject to a disease of the skin, having the character of impetigo sparsa, and affecting in particular the inferior extremities. The itching from this eruption had been for some time so great, particularly at night, as to deprive her of rest, and was (to use her own expression) intolerable. A surgeon, to whom she applied for relief, prescribed a wash, and directed her to dab the parts occasionally with it to allay the itching. From this she found great relief; and on the night of the 26th of December, 1818, on going to bed, the itching being very distressing, she, of her own accord, wetted some linen rags in the wash, and wrapt them round the legs.

The cause of her distress soon ceased, and she fell into a sound sleep. In the morning she awoke with all the symptoms of violent catarrh, and severe pain of the head, referred to the region of the frontal sinuses. The eruption, not only on the legs, but on the fore-arms and other parts of the body, had entirely disappeared. Soon after severe inflammatory symptoms affecting the chest supervened, for which she was largely bled and blistered, and treated with diaphoretics. The disease, however, gradually advanced; irregular hectic was formed; and the expectorated matter, which will be presently described, became daily more copious. She took an opiate occasionally to quiet the cough, but she had frequent exacerbations of the inflammatory symptoms, with great dyspnœa, much despondency of mind, loss of appetite, and prostration of strength.

On the 20th of January, 1819, in the evening, I saw her for the first time. She lay on her back in bed. Face pale and of a leaden hue, lips pale with a bluish tint, expression of countenance very anxious, respiration hurried and unequal, and accompanied with that peculiar sound which attends highly loaded bronchia, commonly called rattling; she could make a long inspiration, but complained of great tightness of the chest on making it: this act did not always excite cough. Her pulse was quick, small, and hard, and beat 90 in the minute. Skin at this

time hot and dry, with the exception of her feet, which were cold and moist. The tongue pale, slimy, and furred in the middle; mouth moist, but clammy; and she complained of thirst: she suffered also from dull pain in the forehead, and occasional drowsiness, and at intervals slept very heavily: appetite for food very bad, slight tenderness in the epigastrium on pressure, bowels costive. Expectoration had been very copious, but for the last twenty-four hours had been nearly suspended, and all her symptoms materially aggravated. She complained of great loss of strength. The expectorated matter had long had the following characters. It was spit up most copiously in the morning, on first waking. In the centre was a circular mass of yellowish pus; surrounding this was a circle of ropy mucus, which in different sputa varied in its degree of transparency, but was always readily distinguishable from the purulent disk: a number of these sputa floated in a quantity of thin frothy fluid, exactly like saliva. There never had been observed any mixture of blood in the expectorated matter.

Mittantur statim sanguinis è brachio $\bar{3}$ x.

Applicentur Hirudines xij. regioni thoracis.

R Hydrargyri Submuriatis,

Pulveris Antimonialis, \bar{a} \bar{a} gr. v.

Confectionis quantum sufficit ut fiat bolus, statim sumendus.

21st.—All her symptoms much relieved; has

expectorated copiously; has had three loose dejections, of a bright yellow colour. Pulse 92.

Appr. Emplast. Lyttæ sterno.

R Potassæ Subcarbonatis, ʒi.

Succi Limonis, f. ʒiss. vel quantum sufficit.

Ipecacuanhæ contritæ, gr. vj.

Tincturæ Digitalis, f. ʒi.

Syrupi, f. ʒss.

Decoct. Hordei simplicis, f. ʒiv. M.

Sumat coch. larga ij. 4tis horis.

Diet, vegetables and milk.

22d.—Increased tightness of the chest; had been very hot and restless all night; complains of pain across the upper part of the chest on drawing a long breath. Expectoration this morning less than usual. Respiration hurried. Pulse 96. Bowels bound.

Fiat Missio Sanguinis ad ʒvj. statim.

Sumat Olei Ricini, f. ʒss. statim.

Contr. Mistura.

24th.—Great prostration of strength. Distressing pain in the head. Pulse irregular and intermitting, 80. Slept very heavily all the first part of the night. Expectoration in the morning very copious, with general perspiration. Spirits much depressed; she says that now it is all over with her, that nothing can save her life, &c.

Contr. Mistura, omittr. verò Tinctura Digitalis.

Diffuse tar vapour through her apartment, and rub the lower extremities briskly with a flesh brush three or four times a day.

On the 26th, 27th, and 28th, she continued mending in every symptom excepting the expectoration, which had become more copious, though attended with little difficulty. Her appetite was improved. Debility very great. No return of her cutaneous disease. Bowels regular. Pulse 90, but softer. She had no pain or dyspnœa after her first morning expectoration, and she has slept soundly for the greater part of three nights.

R Copaibæ, f. ʒiij.

Sacchari, ʒij.

Mucilaginis Acaciæ, f. ʒiss.

Aquæ Fontanæ, f. ʒiv. M.

Sumat coch. larga ij. ter in die.

Continue the flesh brush and the tar vapour.

30th.—Medicine has operated by the skin, kidneys, and bowels. Expectoration diminished in quantity. Pulse 85, softer. The first dose of the mixture made her vomit, but she has kept the succeeding doses in her stomach. Her spirits are better; she entertains, for the first time, hopes of her recovery.

Continuentur omnia.

31st.—Better.

February 3d.—Has a slight return of the eruption on her legs and fore-arms, and complains of their itching: says she cannot bear the application of the flesh brush any longer.

Omit the flesh brush and tar vapour.

Contin. Mistura, cui adde Copaibæ, f. ʒij.

4th, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th. — The expectoration gradually diminished till it ceased altogether; and as it diminished its character gradually altered, the centre purulent part disappearing, till at last it was only frothy mucus. She suffered from her cutaneous eruption and itching, (which she was advised to bear patiently,) till June: she also had occasional cough, but no alarming symptoms. In June she took some sulphur every night, under which treatment she lost her eruption and cough.

From that time she has continued quite free from complaint till January in this year, 1820, when she had a severe catarrh; but it was taken in time, and disappeared without any alarming symptoms, or any return of her cutaneous disease.

Observations.

This case, which places in a very clear point of view the intimate connexion that exists between diseases of the skin and mucous membrane of the lungs, and also shows how nearly the symptoms arising from this affection resemble those which take place in tubercular consumption, occurred in the practice of Dr. Malden, a friend of the author, to whom he is indebted for the above detail.

CASE VII.

Chronic Bronchitis combined with Impetigo Sparsa, and terminating favourably.

T. U., aged fifty-six, labourer, of fair complexion and delicate skin, applied to the author on January 22d, 1819, in consequence of a severe cough and copious thick white expectoration. He had no pain in his chest, and breathed without any difficulty. Pulse not hard, 90. Tongue rather loaded. Bowels irregular.

The cough had come on early in December, and had continued with great violence, often preventing his getting any sleep at night. For many years he had been troubled with an eruption on the thighs; but a short time before the cough began the eruption had disappeared.

He was directed to apply a blister to the chest, to take five grains of the compound calomel pill every other night, and a draught, containing antimonial wine, oxymel of squills, and barley water, three times a day.

He persisted in this plan for a fortnight without the slightest relief of the cough, the fits of which were sometimes so violent as to bring on vomiting. He also complained of considerable dyspnœa, and the expectoration was increased, and more purulent in its appearance.

He had ten ounces of blood taken from the arm,

and was directed twenty drops of balsam of copaiba three times a day.

On the 19th of February the eruption had reappeared on the thighs. The cough was somewhat relieved, and the expectoration diminished. He continued the copaiba.

On the 4th of March the eruption still continued troublesome. The cough and expectoration were nearly gone, and his breathing was not at all affected. He continued the copaiba. He soon recovered from the cough ; the eruption remaining, which he was desired not to attempt to cure.

Observations.

The cough in this man's case appeared on the decline of an habitual eruption on the skin, and continued with a copious expectoration, which was unaccompanied with any pain in the chest, much difficulty of breathing, or great excitement of the pulse, for three months. The pectoral symptoms did not subside until the eruption reappeared under the use of the copaiba.

CASE VIII.

Chronic Bronchitis produced by the Inhalation of Dust.

J. G., aged thirty, whose occupation as a leather dresser constantly exposed him to the inhalation of dust, had for many months been affected with considerable dyspnœa. He applied to the author

May 20th, 1819, in consequence of a severe attack of hæmoptysis. He was directed to lose ten ounces of blood from the arm, to take ten drops of tincture of digitalis three times a day, and fifteen grains of alum every three hours. He soon ceased to spit blood; but the cough, which he had been affected with for a considerable time, did not abate in the least degree, and he expectorated a matter much resembling pus. The difficulty of breathing was considerable, and he had a tight feeling across the chest. He also complained of pain in the epigastric region, and of much tenderness there on pressure. Dejections unnatural. The tongue was loaded.

On the 30th of May he was directed to take a grain of blue pill three times a day, with three grains of extract of hemlock. He continued the tincture of digitalis, and had six leeches and a blister applied to the epigastrium. These remedies relieved the cough and dyspnœa for a short time; but he visibly lost flesh. The dyspnœa and cough returned towards the middle of June. The expectoration increased, and became more purulent in its appearance, and was streaked with blood. The night sweats became profuse. Pulse 120. The face was flushed, and the emaciation considerable. He died early in July.

Dissection.

On dissection no tubercles were found in the lungs, but their substance was rather more solid

than natural. The mucous membrane lining the bronchia was much inflamed and thickened, and several extensive superficial ulcers were found in it. The bronchia were filled with a purulent fluid mixed with blood.

The liver was of a lighter colour than natural. The other abdominal viscera were natural. The heart was rather enlarged. The cavities on the right side were more particularly dilated, and contained much more blood than usual.

Observations.

It is manifest that the continued irritation produced by the inhalation of dust was the cause of chronic inflammation of the mucous membrane, which ended in extensive ulceration, giving rise to symptoms similar to those which are observed in tubercular phthisis. It is worthy of observation, that the cavities on the right side of the heart had become dilated, in consequence of the continued impediment to the free transmission of blood through the lungs.

CASE IX.

Chronic Bronchitis produced by the Inhalation of Dust.

T. W., aged twenty-six, whose occupation as a leather dresser constantly obliged him to be in a dusty atmosphere, was admitted into the Infirmary in January, 1819. For some weeks before, he had

been troubled with dyspnœa, cough, and copious bloody expectoration. When he applied for relief his breathing was very laborious, and his face and lips were quite livid : he had no pain in inspiration, but a distressing straitness across the chest. He complained of incessant cough, and expectorated a purulent bloody matter. Pulse small and contracted, 100. Tongue loaded.

Twenty ounces of blood were taken from the arm, and he was directed a bolus containing five grains of calomel and five of antimonial powder.

His breathing became much less laborious, and the lividity of the face disappeared ; but the cough continued, and the expectoration was increased, the quantity amounting to a pint and a half in one night. The matter was of different colours, some greenish, some white and thick, and much streaked with blood. He was not much emaciated. Under these circumstances the vapour of tar was had recourse to. He inhaled it for half an hour each evening. The cough and expectoration rapidly diminished, and at the end of a fortnight he was almost free from cough and dyspnœa. He described the vapour as producing a sense of suffocation, but always found that he scarcely expectorated any thing afterwards. In a month, contrary to advice, he returned to his old occupation, which soon brought back his complaints. They were again removed by blood-letting and tar vapour. He afterwards took to an occupation which did

not expose him to the inhalation of dust, and on the 15th of August was in perfect health.

Observations.

The infarction of the lungs in this case was so great, from the copious secretion which had taken place, that the air did not produce those changes in the blood which are necessary to the continuance of life. By means of blood-letting the inflammation of the bronchial membrane and congestion of the lungs were considerably relieved; but the membrane was still much diseased, as was evinced by the very large quantity of purulent matter which was still secreted from it. The pitch vapour appeared to stimulate the debilitated vessels, and thus relieve the inflammatory action. When, however, he resumed the occupation which exposed the mucous membrane to continual irritation, the chronic disease soon returned; and it was only by relinquishing this employment that he continued free from cough and dyspnœa.

CASE X.

Throughout the whole of the summer and autumn of 1819, T. W., the subject of the above case, continued in good health, and worked as a day labourer in the country. In the middle of the month of November, after exposure to cold, he had a severe pulmonary attack. He had no medical assistance, and died in forty-eight hours after he was taken ill.

The body was examined, and the following is the account of the dissection given by Mr. Cole, house surgeon to the Infirmary:—

“ The lungs were strongly adherent over their
“ whole surface to the pleura costalis. The mucous
“ membrane of the trachea and bronchia was highly
“ inflamed and ulcerated. The air cells were filled
“ with mucus mixed with pus. The substance of
“ the lungs was much gorged with blood: no
“ tubercles nor vomicæ were discovered.

“ The heart was enlarged, but in other respects
“ it was healthy.

“ The liver looked healthy. On examining its
“ concave surface an abscess was found in its
“ substance, near the situation of the gall bladder,
“ containing about a table-spoonful of highly foetid
“ pus. The other viscera were not diseased.”

Observations.

This examination was peculiarly satisfactory, as it confirmed the opinion which had been formed of T. W.'s case whilst he was a patient of the Infirmary, nearly twelve months before his death. It very well exemplifies the effect which long continued mechanical irritation has in producing chronic ulceration of the mucous membrane of the lungs. It also strongly points out the great dilatation which the blood vessels of the lungs sometimes undergo when the chemical changes which should take place in the blood have for any length of time been impeded. The affection of the heart,

likewise, was just what we might anticipate would be produced, if the free circulation of the blood through the lungs were for any length of time opposed. The right auricle and ventricle were dilated beyond their size, and loaded with blood. Thus a larger quantity of it than natural was thrown into the venous system, and the general blueness of the skin occurred.

The disease in the liver had probably kept up a disposition to bronchial affection after he discontinued his occupation. But the small abscess in its concave part cannot be considered as in any way immediately connected with the death of the patient. This, however, deserves to be noticed as one among many instances of disease in the liver combined with chronic inflammation of the bronchial membrane, which points out the necessity of attending to the sympathy which takes place between the abdominal viscera and the mucous membrane of the lungs.

CASE XI.

Chronic Bronchitis brought on by Inhalation of Dust, producing Tubercles in the Substance of the Lungs.

G. I., aged twenty-five, employed as a leather dresser, who had been affected for several months with cough and hæmoptysis, was admitted an in-patient to the Worcester Infirmary on the 24th of January, 1814. He was much emaciated, had

a frequent hacking cough, accompanied with copious purulent expectoration mixed with blood. He had night sweats, which were general over the body. The dyspnœa was considerable, and he could not take a deep inspiration without suffering much pain. Pulse hard, 120. Tongue morbidly red.

He did not receive any benefit from the remedies that were applied, and died in fourteen days after admission. He had been a healthy man before he worked as a leather dresser, twelve months antecedent to his death.

The body was examined, and many tubercles were found in the substance of the lungs, some of which had suppurated. The bronchial membrane was thickened and ulcerated, and bore marks of having been long inflamed. The other viscera were healthy.

Observations.

It seems likely that in this case the inhalation of dust first produced an inflammation of the mucous membrane of the lungs, which becoming of a chronic nature, was a constant source of irritation to them. It appears probable, that the disease of the mucous membrane caused the formation of tubercles in the substance of the lungs, thus bringing on all the symptoms of tubercular consumption.

CASE XII.

Chronic Bronchitis produced by the Inhalation of Dust.

G. W., aged thirty, (the brother of T. W., whose case is above detailed,) whose occupation as a leather dresser exposed him to a dusty atmosphere, applied to the Infirmary for relief on the 20th of November, 1819. His face was pallid, but the lips of a purplish hue. He had a very violent cough, which came on in fits, more particularly in the evening and early in the morning. The expectoration was copious, consisting of pus and mucus mixed together. His breathing was oppressed, but he took a full inspiration without pain. Pulse 90, full. Tongue loaded. Bowels regular. He had been subject to these complaints for some time; but for a month previous to his application to the Infirmary, during which he had emaciated fast, his symptoms had been aggravated.

Ten ounces of blood were taken from the arm, a blister was applied to the chest, and the copaiba mixture was prescribed three times a day. The patient was advised to relinquish his employments.

He was considerably relieved by the above remedies; and thinking himself equal to work, he recommenced his occupation, which soon caused a relapse; after which he was persuaded to abandon his trade, and become a day labourer. Since that time he has been in perfect health.

CASE XIII.

Chronic Bronchitis produced by Mechanical Irritation.

On the 4th of February, 1813, J. P., aged fifty-seven, was admitted as an in-patient in the Worcester Infirmary. For some time before admission he had been subject to cough, expectoration, and tightness across the chest. Three days before his application for relief he was seized with hæmoptysis, for which he lost blood. When admitted he had a cough, with sanguinulent expectoration, and constriction across the breast. Pulse hard and full. Surface hot. Tongue white.

He was bled from the arm, had a blister applied to the chest, and took one grain of digitalis three times a day. Under this treatment the hæmoptysis went off, but the dyspnœa continued, as well as the cough, which was now accompanied with copious purulent expectoration. He evidently emaciated, and his head and arms during the night were bedewed with perspiration. Pulse 96. He had a constant discharge kept up from the chest by blisters, and took ten drops of tincture of digitalis, with twenty of diluted sulphuric acid, three times a day. On this plan he recovered in a month.

Observations.

This man was a stone cutter, and attributed his disease to receiving small particles of stone into

the lungs when at work. It seems probable that the disease was entirely confined to the bronchial membrane; notwithstanding symptoms came on, after the subsidence of the hæmorrhage, very much resembling those which occur in tubercular consumption. We can scarcely conceive that these symptoms would have yielded so readily if they had arisen from disease in the substance of the lungs. The occupation of the patient was such as exposed the bronchial membrane to constant irritation, and it may therefore be presumed that it produced a chronic inflammatory action in that part, which gave rise to the dangerous symptoms.

CASE XIV.

Chronic Disease of the Liver, with Disease of the Bronchia. Communicated to the Author by Dr. Malden.

May 22d, 1816, Miss A., aged twenty-two. Countenance pale and sallow, and expressive of great anxiety; respiration laborious and irregular; complains of frequent fluttering at the heart; has cough, which is much aggravated at night at first lying down in bed, and in the morning at first waking; dyspnœa and palpitation increased by walking, particularly by ascending the stairs; yet when sitting she can make a long inspiration, and retain the air a short time in her chest without its exciting her cough. Her voice, which is very

feeble in general, fails her towards night. She complains of a sense of weight in the right hypochondrium, and prefers lying on that side: on examination there is an unusual fulness discoverable in that region; but pressure does not produce pain. Expectoration greatest in the evening: sputa consist of a ropy mucus of dark reddish brown colour, occasionally streaked with bright red. Pulse feeble, intermitting, and irregular; varying from 76 to 86 or 88. Skin of the trunk hot and dry, that of the extremities dry, but cold: complains of heat and thirst at night; but has no sweats. Tongue covered with a thick white fur, very slimy, edges pale; mouth and lips clammy; appetite for food for the most part bad, although occasionally she feels a great craving, and eats heartily, on which occasions she never fails to suffer from distention and pain in the epigastrium. Bowels generally very torpid; dejections of the colour and consistence of clay, with which undigested portions of food are frequently mixed: sometimes they are of a fluid consistence, dark coloured, and of a very offensive odour: urine copious and pale; catamenia regular. Has occasionally most acute pain of the head, accompanied with nausea, and relieved by spontaneous vomiting. She was first affected with cough and weakness of voice three years ago, from which she has not since been entirely free, though at times she has been much relieved. In the

summer of the preceding year she used cold sea bathing without medical advice, and all her symptoms have increased more rapidly since.

From this time to that of her death, which occurred on the 29th of March in the following year, her complaints became gradually aggravated, and were, during that space of time, little relieved by any of the modes of treatment adopted.

For a few weeks after I first saw her she seemed to derive benefit from an alterative course of the pilula hydrargyri, with small doses of the magnesiae sulphas. The dejections assumed a more natural appearance, the tongue became cleaner, and the cough less troublesome; but the expectoration was not diminished or altered. After this time the bowels became more and more difficult to move, and the dejections continued clay-coloured till her death.

This appearance was not altered by ten grains doses of hydrargyri submurias, which, whenever exhibited, produced severe tormina. During the winter of 1816-17 she suffered more than she had before done from excruciating pain of the head, which she said felt as if a waggon wheel were crushing it. This was not now relieved by spontaneous vomiting as before, and emetics much aggravated it. The temporal artery was once opened, and leeches were frequently applied, without any diminution of this symptom. It was accompanied with distressing nausea, and a violent

craving for ardent spirit, the use of which she was forbidden; but her sufferings continued so severe that her friends could no longer resist her solicitations for brandy. The nausea and the pain of the head ceased soon after the brandy was received into the stomach, and upon every return of these symptoms this remedy unerringly succeeded. The spiritus ammoniæ aromat. and æther sulphuricus were successively tried as substitutes for the ardent spirit, but they afforded no relief. Small doses of the capsicum in the form of pills also failed. She had at this time much hysteria, and the expectoration became more and more mixed with pure pus. The pulse never more than 90; almost always intermitting. A short time before her death, (which was produced by the lungs no longer relieving themselves from the increased bronchial secretion by expectoration, so that suffocation gradually supervened,) she had very irregular action of the heart, and said she felt "as if she had two hearts." Frequently, when the beats of the radial artery were distinct at the wrist, the heart communicated to a hand applied to the chest only a sensation of indistinct fluttering.

Dissection, eighteen Hours after Death.

Skin of the whole body slightly tinged with yellow; a considerable thickness of adipose membrane beneath the common integuments. Indeed the body was not so much emaciated as might

have been expected from the length and nature of her illness.—*Abdomen.* The stomach and intestines much dilated with air; about a pint of limpid yellow serum in the sac of the peritonæum. No thickening of the peritonæum. No adhesions. The liver enlarged to nearly twice its usual size; the left lobe occupying a considerable portion of the left hypochondriac region. The inferior margin of both lobes thick and rounded; the colour of a dirty yellow consistence, so soft as to be easily penetrated by the slightest pressure of the finger. The parenchymatous structure was changed into a mass of granules not much larger than pins' heads. The gall bladder was distended with a yellow aqueous fluid, with a slightly bitterish taste. The spleen was of its usual size, but internally quite disorganized, resembling a sac, containing a dark pultaceous mass. The ovaries were both enlarged, and contained several small cysts, for the most part filled with a transparent gelatinous fluid; one, however, contained pure blood. The kidneys very pale and flaccid. *Thorax.*—The sac of the right pleura contained twelve ounces of limpid serum. The mucous membrane of the trachea and bronchia much thickened, the surface pulpy, and most minutely injected with blood, so as to be rendered of a deep purple colour. In the trachea were several small superficial oblong ulcers, with bright scarlet edges and clean bases. The trachea, bronchia, and air cells, were loaded with a dark brown fluid mixed

with pus. There were no tubercles in either lung. The heart was healthy in structure, pale, and flaccid. The right auricle and ventricle full of blood. The left auricle the smallest and least muscular I ever saw, which, with the left ventricle, was quite empty.

CASE XV.

Chronic Bronchitis, produced by Hepatic Disease, terminating fatally.

On the 19th of September, 1813, M. M., aged twenty-five, was received into the Worcester Infirmary. Her complaints had begun, twelve months before admission, with pain in the right hypochondrium, tenderness in the epigastric region, inability to lie on the left side, and constipation. About six months after the first attack she began to cough, felt a tightness across the chest, and had some degree of dyspnœa. These symptoms gradually increased, and were soon accompanied with a free expectoration. She had, at the period of her admission, much tenderness in the epigastric region, pain in the right hypochondrium, flatulence, lowness of spirits, irregular bowels, and foul tongue. She also complained of a tightness across the chest, but took a deep inspiration without pain; her breathing was short, and she coughed very much. Expectoration copious, consisting of tenacious mucus, mixed with a pus-like substance. She perspired at night. Pulse 100. She was emaciated. In the

beginning of October the cough and expectoration had increased, the night sweats had become more profuse: she could not lie down on either side in bed, but was obliged to continue on her back, with her shoulders elevated. The legs were swollen, dejections dark coloured, and she had lost her flesh and strength fast. At length she had well marked hectic, and died on the 20th of October.

On examination after death the liver was found enlarged, of a light colour, and its peritonæal coat much thickened. The other abdominal viscera were healthy. There was no inflammation of the pleura. Some tubercles were found in the substance of the lungs, but none of them had proceeded to suppuration.

The mucous membrane lining the bronchia was much injected with blood, and the capillaries dilated; the membrane was generally thickened, and in some places ulcerated; the cells were filled with purulent matter mixed with mucus.

Observations.

The well marked hectic fever, the cough, and copious pus-like expectoration, had led to the belief that the lungs must have been almost destroyed by ulceration before the death of the patient; and yet the only disease in the substance of the lungs which dissection manifested, were some incipient tubercles, none of which had proceeded to suppuration; and of course they could not have afforded

any of that great quantity of matter which was expectorated before the death of the patient. We are, therefore, compelled to admit, that this matter must have been secreted from the diseased membrane. It seems most probable that the irritation in the mucous membrane was the cause of the formation of tubercles in the lungs, which, if the strength of the patient had not been exhausted, and hectic had not come on in consequence of the profuse discharge from the mucous membrane, would doubtless have proceeded to suppuration, and tubercular phthisis would have been produced. From the history of the case, it appears that the hepatic affection existed long antecedent to the pulmonic attack. The affection of the mucous membrane in this instance, therefore, may be attributed to sympathy with the disease of the liver.

CASE XVI.

Chronic Bronchitis combined with Hepatic Disease.

On the 26th of September, F. W., aged forty-five, was made an in-patient of the Infirmary, being affected with dyspnœa, cough, without expectoration, pain in the right hypochondrium, tenderness in the epigastric region, hot skin, hard and quick pulse, and constipated bowels. On the 30th a copious mucous expectoration came on, the pain in the right hypochondrium continued, and his dejections were still unnatural. In the beginning of

October he was visibly losing ground. His cough was worse, and the expectoration bore a purulent character. His face was flushed in the evening, he had sleepless nights, and was frequently bedewed with perspiration. He evidently emaciated, and gradually lost his strength. His pulse was constantly more than 100. The abdominal complaints still continued.

Towards the middle of October it was evident the disease was drawing to a close. He had the complete hectic flush, extreme emaciation, night sweats, harassing hacking cough, with very copious pus-like expectoration. He died the latter end of October.

Dissection.

The peritonæal coat of the liver was found thicker than natural, and its substance hardened. The other abdominal viscera were healthy.

The structure of the lungs was healthy, and the pleura was not inflamed.

The bronchial membrane was thickened and extremely vascular. The bronchia were full of pus-like fluid. The heart was healthy.

CASE XVII.

Diseased Liver, combined with Chronic Inflammation of the Bronchia and Tubercles in the Lungs.

M. B., aged twenty-two, was received into the Worcester Infirmary on the 20th of August, 1814.

She had caught cold three months before admission, and ever since that time had been troubled with cough and shortness of breath.

When admitted she complained of pain in the right hypochondrium, tenderness in the epigastric region, constant cough, with copious expectoration, foul tongue, irregularity in the bowels. Pulse quick. She was considerably emaciated. In a short time after she was taken into the Infirmary she appeared slightly to improve, but about the beginning of September she evidently became worse. The breathing was more oppressed, the cough worse, with a more copious expectoration, which was decidedly pus-like in its appearance. She had a regular evening exacerbation of fever, and profuse perspirations broke out during the night. She lost her flesh and strength very rapidly. She died about the middle of October, with all the symptoms of confirmed phthisis. The tenderness in the epigastric region continued to the last.

Dissection.

The liver was found enlarged, and its peritonæal coat inflamed. The other abdominal viscera were healthy.

There were many tubercles in the substance of the lungs, several of which had suppurated. The trachea was full of pus, mixed with mucus. The bronchial membrane appeared thickened, and was much inflamed.

Observations.

There are circumstances in this case which render it obviously different from the majority of this description we meet with. The affection of the lungs preceded the disease in the abdominal viscera, which latter affection did not much influence the former. The emaciation was rapid very early in the progress of the disease, and the degree of dyspnœa was much greater than it ever is when the abdominal is the primary affection. The cause too which gave birth to the disease was obviously one which acted principally on the lungs, and was not at all of a nature to affect the digestive organs.

CASE XVIII.

Chronic Disease of the Structure of the Lungs and Bronchia combined with Hepatic Affection.

S. G., aged twenty-three, was received into the Worcester Infirmary on the 29th of September, 1819. She had pain of the chest, frequent cough, with copious expectoration, face of crimson hue. Pulse very quick and hard. Pain in the right hypochondrium, with tenderness on pressure. Bowels irregular. Six leeches and a blister were applied to the epigastrium. She took eight drops of tincture of digitalis, and fifteen drops of tincture of meadow saffron, three times a day.

The pain was relieved, and the cough became better: but she was continually exposed to cold in her occupation, which brought on a return of her complaint, and she was received into the Infirmary. She had then well marked hectic, she emaciated fast, and died in the middle of November.

Dissection.

There was a considerable quantity of purulent fluid in the left side of the thorax. A good deal of coagulated lymph on the pleura. Pleura on the right side inflamed, but no fluid on that side. Small ulcers were found on the mucous membrane of the bronchia, and it was generally inflamed. There was a large abscess in the left lung. The other lung was much indurated, and lymph was thrown out in the cellular membrane, which seemed to follow the course of the bronchial cells. There were also tubercles in parts of the lungs, some as large as filberts. The heart was healthy.

The liver was enlarged, hardened, and light coloured, and bore the nutmeg appearance. Legs, arms, and thighs œdematous.

Observations.

This woman could not inform us when either the hepatic or pulmonic disease commenced, and there is nothing in the appearances on dissection which can guide us in that particular. From the symptoms, however, it appears most probable that the

pulmonic disease arose quite independent of the hepatic affection. The acute pain of the side was a convincing proof that it was not a case of pure bronchial inflammation; from which it seemed also probable that the pleura was much inflamed, and this on dissection was proved to be the case.

At the same time the copious expectoration seemed to show that inflammation had taken place in the mucous membrane of the bronchia. The constant flush on the cheek, and the parched feel of the hands, which do not take place in simple bronchitis, also warned us that the disease must have extended to the parenchymatous structure of the lungs.

This may be regarded as an instance where frequent exposure to cold brought on extensive inflammatory action in the cavity of the thorax, which was combined with hepatic disease. But the disease of the thorax arose quite independent of the abdominal affection; it assumed the form peculiar to chronic inflammation of the lungs when degenerating into phthisis. The hepatic symptoms were not at all prominent, and the pulmonic complaint was little if at all influenced by them.

CASE XIX.

Ulcerated Stomach combined with Chronic Bronchitis and Inflamed Pleura.

J. B., aged fifty, was received into the Worcester Infirmary on the 20th of March, 1814. He had

for two years preceding been affected with vomiting, which generally came on about half an hour after taking food. He complained of a pain in the epigastric region, and there was considerable tenderness in that part. He had a constant unpleasant taste in his mouth, and his countenance was sallow and unhealthy. Bowels regular. Pulse 90. Since the first attack he had emaciated a good deal, but did not observe any difference for some time previous to admission. He appeared somewhat relieved by laxatives and a blister to the epigastrium.

In about a fortnight after admission a cough came on, which was attended with a slight expectoration and some dyspnœa. In a few days he complained of some pain in the left side, which was increased by inspiration. His cough was worse, and he expectorated a considerable quantity of mucus. His pulse became quick and hard, and the surface hot. The vomiting was diminished.

The remedies employed were not effectual in resisting this pulmonic attack. His respiration became more and more laborious, and was accompanied with a wheezing noise. The cough was daily more harassing, the expectoration copious, and resembling pus. The pulse became quicker, and he evidently lost flesh. The gastric symptoms were less severe than when he was admitted.

In three weeks from the first appearance of the pectoral symptoms he was greatly emaciated, his breathing was very difficult, he had a constant

hacking cough, an astonishingly copious pus-like expectoration, and profuse night sweats. He died in the fifth week.

On dissection, there was a good deal of lymph found on the pleura, and pretty general adhesion with increased vascularity of the membrane. The substance of the lungs was free from tubercles, or any appearance of inflammation. The bronchial membrane appeared generally thickened, and circular portions of it were highly vascular. The air cells were full of purulent matter mixed with mucus, which in some places was streaked with blood. The liver was harder than in ordinary cases.

There was a large ulcer near the pyloric extremity of the stomach, and the coats of that organ were very much thickened.

The intestines were healthy.

CASE XX.

Disease of the Bronchial Membrane and of the Substance of the Lungs combined with Disease of the Stomach.

J. G., aged forty, a man of spare habit, was brought to the Worcester Infirmary on the 8th of May, 1819, having been suddenly taken ill after drinking cold cider, when very hot. His countenance was sunk and cadaverous, the body cold, the pulse small and weak. He had violent pain in the epigastric region, which was very tender

to the touch. The abdominal muscles were violently contracted, and he had vomited twice. He said that he had been subject to stomach complaints for years, and occasionally vomited his food soon after he had taken it.

He had some brandy and water given him, took a draught of æther and laudanum, was put into a warm bath, and had a common enema injected. In the morning he appeared somewhat relieved, but the tenderness over the abdomen still continued, and he had vomited three times during the night. The heat of the surface had returned, and the pulse had become stronger.

He was bled to the extent of twenty ounces from the arm, and had sixteen leeches applied to the epigastric region. He took a calomel bolus, and a drachm of Epsom salts, every two hours. The pain and tenderness were much relieved by these means, but the vomiting continued; the anxiety of countenance was not removed, and the bowels remained obstinately costive. By the aid of a turpentine injection his bowels were moved, and afterwards continued active; yet the vomiting did not subside, his countenance was sallow, there was great tenderness in the epigastric region, and the quickness of the pulse did not go off.

He had six leeches and a blister applied to the pit of the stomach, which relieved the vomiting; but a most distressing cardialgia then came on, his pulse continued quick, and he lost his flesh. For a

fortnight there was no alteration in his symptoms; he occasionally vomited, his countenance looked ghastly, he was tormented with flatulence and cardi-algia, and had a bad taste in his mouth. A seton was cut in the epigastric region, and he took alterative and stomachic medicines. Under this plan his stomach complaints appeared to improve. He nearly lost the vomiting, and was not so much troubled with flatulence. But about the latter end of May the abdominal symptoms became combined with cough, copious expectoration, and increased emaciation. He was removed from the Infirmary for the advantage of change of air, but his pectoral symptoms rapidly increased; he expectorated large quantities of purulent matter, coughed continually, the breathing became very short, and hectic fever came on. He died in a month after leaving the hospital. The body was not examined.

Observations.

This man said that he had not in the early part of his life been subject to cough, and of late years had only been troubled with dyspeptic complaints. For three weeks after he was received into the Infirmary he had no indication of pulmonic disease. The symptoms all seemed to point out some severe gastric affection, which gave rise to great disturbance in the constitution. In a month after the attack pectoral ailments began to appear, and the more severe abdominal symptoms in some

degree to subside. The pectoral affection rapidly increased, and he died with all the symptoms of pulmonary consumption.

CASE XXI.

Chronic Bronchitis produced by diseased Mesentery.

J. G., aged twelve, a convalescent from fever, of delicate constitution, was visited by the author 20th Feb. 1819. She had a frequent pulse, occasional rigors, quick and laborious respiration, cough, with copious purulent expectoration. Pulse 120. Tongue white. Bowels open. She had recovered from continued fever six weeks. The mother said that the abdomen had been large and rather painful ever since the feverish attack, but the cough and shortness of breath had only occurred within the last fortnight. She was much emaciated.

Six leeches and a blister were applied to the abdomen. She took three grains of calomel every second night, and eight drops of tincture of digitalis three times a day. She was not at all relieved by this treatment. The emaciation proceeded rapidly, the cough was incessant, and was accompanied with a copious pus-like expectoration. She had profuse night sweats. She died on the 7th of March.

When the body was examined, the mesenteric glands were found much diseased. They were

much enlarged, and many of them had suppurated. The intestines were united together by coagulated lymph, which did not appear to have been recently deposited. The liver was healthy.

The lungs did not collapse when the thorax was opened. The pleura was not inflamed. There were no tubercles in the substance of the lungs, nor were they at all hardened. The bronchial cells were filled with a mixture of pus and mucus. The bronchial membrane throughout was much inflamed, and some parts of it were ulcerated.

Observations.

It was evident that in this instance the disease commenced in the cavity of the abdomen, affecting principally the mesenteric glands, and their peritonæal covering. The mucous membrane of the lungs seemed at first to be affected by sympathy with the abdominal affection. This at length produced a chronic inflammatory action in that part, which terminated in ulceration, and occasioned a copious purulent expectoration, dyspnœa, and other symptoms of tubercular consumption.

CASE XXII.

Chronic Disease of the Peritonæum and Liver combined with very extensive Disease of the Lungs.

J. H., aged twenty-three, was received into the Worcester Infirmary on the 20th of November,

1819. He complained of cough and dyspnœa, copious muco-purulent expectoration, and pain and tenderness over the whole of the abdomen, particularly in the right hypochondrium. The abdomen did not seem enlarged, nor feel hard. The tongue was dry. The thirst great. Pulse 108. Belly regular, urine scanty. The lower extremities were œdematous. The body was very much emaciated.

He had been ill for three years with cough and spitting, but could not tell when the abdominal complaints first appeared.

He had six leeches and a blister applied to the right side, and took a pill, containing one grain of blue pill, one grain of extract of henbane, and one grain of squills, four times a day, with some drops, composed of tincture of digitalis and tincture of meadow saffron.

For a few days he was relieved by this plan. The cough became quieter, the expectoration diminished, and the œdema of the legs disappeared: the difficulty of breathing, however, was never relieved. On the 29th he became suddenly worse, and expired in a short time afterwards.

Dissection.

The pleura adhered together. The lungs did not collapse when the thorax was opened. When the scalpel was thrust into the lungs a large quantity of blood gushed out. The trachea was found full

of purulent matter. The membrane was very vascular, and many small ulcers were seen on it. On tracing the ramifications of the bronchia, the same appearances of the mucous membrane presented themselves.

There were many hard tubercles in the substance of the lungs, but none of them had suppurated. The substance of the lungs in many parts was much hardened, and a good deal of white matter, resembling coagulated lymph, was deposited in the cellular membrane. The large blood vessels of the lungs were very much dilated.

The right auricle of the heart was considerably enlarged, and contained a good deal of blood; and the whole of the right side of the heart was more rounded than natural, in consequence of the distention of the ventricle. The auriculo-ventricular valves on that side were in some degree thickened.

When the abdomen was opened, the contents of that cavity had a very unnatural appearance. That part of the peritonæum which lines the abdominal muscles was so adherent to the viscera beneath that it was with difficulty separated. The peritonæum was much altered in structure. It was much thickened, was beset with granulations and tubercles, and much loaded with blood.

The omentum majus bore a very singular appearance. It had lost all resemblance to fat, was much thickened, and very hard. The whole of its surface

was granulated, and its vessels were loaded with blood.

In some parts also large quantities of coagulated lymph were deposited.

All the intestines adhered together, and were covered with gelatinous matter. Their peritonæal covering appeared very vascular.

The liver was enlarged, and its colour lighter than natural. A section of it resembled the section of a nutmeg.

Observations.

The thing of most importance to determine in this case is the relation observed between the affection of the lungs and that of the abdominal viscera. The history given by the man previous to his death, does not inform us positively on this head; for we had no account from him of the rise of the abdominal symptoms; but he told us that he had for three years been affected with cough, expectoration, and dyspnœa. We are, therefore, left in doubt whether the affection of the lungs preceded the abdominal disease, or the abdominal disease that of the lungs; or whether they were simultaneous affections.

The state of the lungs particularly deserves the reader's attention. The subject of this disease had been for three years expectorating large quantities of matter, and yet there was no part of the struc-

ture of the lungs which could have afforded this matter, excepting the bronchial membrane; for even at the time of his death none of the tubercles were suppurated, and there was no abscess; whereas the bronchial membrane was much inflamed and ulcerated. The affection of the lungs was such as always takes place when the bronchial membrane has been so much diseased that the changes in the blood do not go on properly. The blood vessels in consequence of that obstruction became varicose, and the lungs to an extraordinary degree loaded with blood. The heart also felt the effects of this obstructed pulmonary circulation. The cavities on the right side of that organ were much dilated, and overloaded with blood.

From the state in which the tubercles were found in this case, and from the induration of the cellular tissue of the lungs, it appears more than probable that the mucous membrane of the bronchia was the part of the lungs first affected, and that the inflammation of the mucous membrane afterwards spread to the cellular structure of the lungs. This produced an induration of their substance, which was speedily followed by tubercles.

CHAPTER V.

OF DROPSY, AS DEPENDENT ON INFLAMMATION
OF THE MUCOUS MEMBRANE LINING THE
BRONCHIA.

THERE are few diseases whose pathology has undergone more investigation than dropsy. Within these few years especially it has fixed the attention of several men of talent in our own country, whose exertions have happily been successful in throwing light on this subject.

The end proposed in the present chapter is to point out the relation which sometimes subsists between inflammation of the bronchial membrane and dropsy. This may be done by an appeal to facts, from which we may endeavour to draw such deductions as may assist us in ascertaining the true nature of the latter disease, when combined with disorders of the thoracic viscera.

It will not, therefore, be necessary to detain the reader by even hinting at the general history of dropsy, nor by attempting to estimate the relative value of those speculations regarding its proximate cause with which the medical periodical press has lately teemed. To say the truth, there is but little inducement to take up this question, because it would appear, that an attention to the state of the

functions in the respective cavities may throw more light on the treatment of dropsy than any subtle disputes on the excitement or debility of the exhalants, or on the retrograde and elective actions of the absorbents. Besides, such discussions seldom tend to the improvement of the practice of medicine: so that it is doubtful whether, after much toil, we could produce any facts which, to a mind unprejudiced by the dogmas of the schools, would appear at all satisfactory.

In order, however, to avoid the imputation of neglecting the labours of others, it is intended, before giving any account of the symptoms, nature, and treatment of the dropsical affection we are about to discuss, to notice some works in which cases of dropsy are related, which were preceded and accompanied by bronchial inflammation.

Bronchial inflammation has till lately been so little regarded, that it cannot be justly considered matter of surprise that we do not find any detailed observations in the writers on dropsy, pointing out the frequent dependence of this affection on inflammation of the mucous membrane of the lungs.

In none of the writers of this country is any express attention paid to this combination. Yet, from the facts that will be brought forward, it appears that it is neither an uncommon occurrence, nor one which should be neglected by the physician who is anxious to arrive at more correct pathological views respecting dropsical diseases.

Although medical writers in general have been inattentive to this connexion, there are, nevertheless, some cases and observations recorded, which are calculated to illustrate our subject. It may be sufficient for our present purpose to pay attention to such as may be met with in two late writers, Dr. Blackall and Dr. Crampton, whose labours have done much to advance our knowledge of dropsical affections.

In the 11th case related by Dr. Blackall, emaciation, cough, copious expectoration of bloody sputa, great dyspnœa, a croupy sound in breathing, palpitations, irregular pulse, and anasarca, succeeded to symptoms of disordered digestion; and death soon followed*.

On dissection, a schirrous tumour was found surrounding the bronchial tube. The lower part of the trachea, but particularly the right branch, was inflamed, and covered internally with a thin red lymph. But there was no appearance of ulceration of the inner membrane.

Some old adhesions of the lungs were met with, but there was no fluid on either side of the chest. About two ounces of fluid were discovered in the pericardium.

The next case which may be mentioned, is one in which frequent attacks of chronic bronchitis seemed to have forerun hydrothorax. It happened

* Blackall on Dropsies.

in a woman of sixty years of age. The urine was not coagulable, and she was cured by vinegar of squills and calomel*.

The last example which shall be quoted from Dr. Blackall, is the 8th case in the 9th chapter. In this instance it would appear that the patient had long been affected with chronic inflammation of the mucous membrane of the lungs. So large a quantity of matter was secreted from it, that the existence of an ulcer in the lungs was suspected. Hydrothorax succeeded to these symptoms. The urine coagulated. He took large doses of vinegar of squills, and recovered. I.

In one part of his work Dr. Blackall observes, that a purulent expectoration often accompanies that kind of dropsy in which the urine coagulates. Such an expectoration he does not regard as necessarily affording a fatal prognosis, for he has seen several patients recover from this state. S.

It is probable, from the facts hereafter to be adduced, that the purulent expectoration, in cases of this description, does not proceed from an ulcer of the lungs, but from an inflamed bronchial membrane.

The very valuable report on dropsies, published by Dr. Crampton, in the Transactions of the King's and Queen's College in Ireland, contains, perhaps, the most interesting collection of cases that has

* Blackall on Dropsies, p. 51. I. p. 173. S. p. 354.

ever been submitted to the public. The very extensive practice of the chronic wards in Stephen's Hospital has afforded him ample means of watching the progress of this disease. He conceives that it is a point of the first importance, in the treatment of dropsy, to attend to the early symptoms, to detect, if possible, the organ which was first affected, and to ascertain what changes have taken place in it.

He cursorily speaks of the connexion between chronic bronchitis and dropsical diseases; and, as is obvious from the following quotation, attaches much importance to it. "In those dropsical
" affections which are symptomatic of confirmed
" phthisis, general bleeding almost always hurries
" the fatal event. It is material, however, to be
" able to discriminate such affections from chronic
" inflammation of the pleura, of the *bronchia*, or
" of the parenchymatous structure of the lungs;
" as in those latter instances venesection is frequently the means of rapidly restoring the patient
" to health. Some of the cases reported, which
" soonest gave way to treatment, were of this
" description; the swellings having almost immediately disappeared after one or two general
" bleedings*."

* Transactions of the Association of the Fellows and Associates of the King's and Queen's College of Physicians in Ireland, vol. ii. p. 263.

Dr. Crampton does not, however, if we may judge of the report of the fatal cases, seem to have very frequently examined the mucous membrane after death; for the 12th case did not afford, on dissection, any evidence of disease in the lungs, although the patient had for many years been troubled with cough and dyspnœa. And in his observations on it he says, "Had the bronchial surfaces been minutely examined, other causes perhaps might have been discovered, to account for the long existence of the catarrhal state*."

This writer tells us, that he has paid a good deal of attention to the urine, in order to learn what practical indications may be deduced from its property of coagulation in dropsy. But he has not been able to arrive at any satisfactory result. "In a considerable number of cases," he observes, "the urine was tried by the test of heat, as to its power of coagulating; but the proportion of instances where it took place was very inconsiderable, compared with those which did not coagulate; nor was I able to connect those cases where inflammatory symptoms existed, with the presence of coagulable urine. In many of those which appeared to me to require the prompt use of the lancet, the urine did not coagulate†."

Throughout the whole of this report we find him

* Dr. Crampton's Clinical Report, p. 179.

† Appendix to Clinical Report, p. 273.

attending to the state of the viscera, as the sole guide to the proper treatment of the disease.

At the conclusion of his observations on the cases, this writer says, that "so far as can be collected from the preceding histories, a selection of the diuretics to be employed appears a matter of less consequence than might have been expected; where the medical treatment was directed to prevent or remove those tendencies to organic changes of structure, which have been observed to precede dropsical effusion, little then was left for the officinal diuretics to accomplish*."

In the above opinion he is at issue with Dr. Blackall, who insists that the state of the urine may be expected to direct us to a more correct application of diuretic remedies. This he considers as one among the many advantages which may be derived from the distinction of urine which is, from that which is not, coagulable.

The reader may wonder that this chapter is not adorned with a more copious reference to writers. It is true, that by turning over some of the ancient medical archives we can find numerous instances, from whose history we may conclude that the connexion between bronchitis and dropsy is not an uncommon occurrence. But we should not collect any facts which would be so precise as to

* Dr. Crampton's Clinical Report, p. 270.

allow us to deduce certain results from them. Without further preface, therefore, the author will present a concise account of the symptoms, nature, and treatment of dropsy, as dependent on bronchial inflammation.

Of the Symptoms.

It will not be necessary here to give a lengthened account of all the symptoms of dropsy. The author will rather endeavour to fix upon certain characteristic symptoms, which appear when it arises from bronchial inflammation.

Its mode of commencement varies considerably, according to the age of the patient, and also according to the period of the bronchial inflammation at which the dropsical symptoms show themselves. But there are certain distinctive marks which never fail to be present. These may be first mentioned. The breathing is very laborious in this variety of dropsy. The patient can rarely continue long in the horizontal posture without feelings of suffocation. A wheezing noise accompanies the respiration, and the voice is often croaking. By the least exertion the patient becomes breathless. He generally complains of a distressing sense of stricture across the chest, as if something were tied tight around that part. The lips are frequently of a violet colour, and the face is not seldom livid. The eyes are more prominent than natural, and the whole countenance is anxious. A harassing cough

is generally present, and it is usually attended with a very copious expectoration, which is of various appearance, blood, pus, and mucus being often blended together. In some instances, however, the cough is unattended with much expectoration, and mucus alone is brought up. There is scarcely ever any pain in coughing, and a deep inspiration is usually taken without any other uneasiness than that of momentarily increasing the sense of constriction across the chest.

The action of the heart is disturbed. The patient often points under the left breast, and expresses the greatest uneasiness there. The most violent palpitations sometimes come on. The action of the heart is felt beyond its ordinary limits. In some instances we may distinguish it in almost any part of the thorax. It may also be plainly felt in the epigastrium. The sensation given to the hand by the contraction of the ventricle differs very materially from that which we feel in the natural state. It more resembles an undulation than the regular action of the heart. The heart frequently beats with irregularity; but the degree of irregularity differs very considerably. In general the left side of the thorax does not sound on percussion.

Combined with these pectoral complaints, we in many cases find evidences of disease in the abdominal viscera. Pain in the right hypochondrium, with tenderness in the epigastric region, are

occasionally present, though they do not necessarily attend; and a fluctuation may sometimes be distinguished in the abdomen.

The pulse exhibits the greatest variety in its character. It is often irregular. Sometimes it is not quicker than natural, yet hard and full; at others it is small, quick, and contracted. The tongue and the whole of the mouth are clammy, and the patient generally complains of urgent thirst. The skin is dry, and often rough during the day. In the night perspirations occasionally break out. The bowels are often irregular, and the *fæces* unnatural.

The urine is scanty; sometimes high coloured, and depositing a copious thick sediment; at others, limpid and without sediment. When heated above the 160th degree of Fahrenheit's scale, or when the stronger acids are added to it, we can often discover flakes of coagulated albumen in it. This, however, is by no means a constant occurrence. All the symptoms above mentioned are often present without our being able to detect any such coagulating property in the urine.

In addition to these symptoms, the head, trunk, and extremities, are swollen; and pit, on pressure being made.

The most favourable changes that can take place are, a diminution of the difficulty of breathing, a more free and less harassing cough, and, in those instances where the cough has been dry, a free

expectoration. This is sometimes a favourable occurrence, if it be accompanied with a diminution of the dropsical symptoms, even although the sputa should have a purulent appearance and be mixed with blood. It indicates that the mucous membrane is less inflamed. The action of the heart is then rendered more regular: the palpitations are less distressing: the skin is not so dry, and the mouth less clammy: the urine increases in quantity, and becomes more healthy in its appearance: the swellings of the body and extremities go off; and if there have been fluctuation in the cavity of the abdomen, it now ceases. All the bad symptoms subside, and the patient is restored to a comparative degree of health. The breathing, however, continues short; and if the exciting causes be at any time applied, there is a remarkable susceptibility of a similar attack.

This may be regarded as the most favourable termination. The disease is often much more perverse. After the subsidence of the dropsical symptoms we sometimes find that we have to contend with a disease not unlike phthisis pulmonalis.

The breathing continues high and laborious. The patient is still subject to frequent palpitations. He has a hacking cough, which prevents sleep. He expectorates a very great quantity of matter, which varies in its appearance, blood, pus, and mucus, being often mixed together. He has now

night sweats, and emaciates fast. The strength fails, and the pulse becomes very frequent, and is sometimes irregular. The patient can, however, take a deep inspiration without much uneasiness, and can lie on either side in bed. There is also a tightness across the chest; but no pain is felt.

When these complicated symptoms occur, the disease commonly terminates fatally. But even from this dangerous state the patient sometimes recovers. In this event the cough and expectoration diminish; the breathing becomes less difficult; the tightness across the chest goes off; the night sweats gradually subside; the strength returns; and the patient is slowly restored to an imperfect state of health.

When no favourable change takes place, a gradual increase of all the bad symptoms may be expected. The respiration becomes more laborious, the face livid, and the eyes protruded. The heart is more irregular in its beat, and the pulse weaker. The heat of the body falls below the natural standard; perspirations break out; the cough diminishes; expectoration ceases; and a gurgling noise is heard at every inspiration. The urine is now extremely scanty, and the body much swollen. At no distant period suffocation ensues.

Such may be considered the general character of this disease, varying of course in particular instances.

Of the Rise and Progress of this Affection.

In tracing to their source the symptoms presented by the variety of dropsy we are considering, great diversity will be found in the affection which has preceded the dropsical symptoms. This of course gives a corresponding modification of the supervening disease.

Sometimes we observe the dropsical affection come on at the termination of a violent attack of acute bronchitis, when the system appears quite exhausted, and every energy necessary to combat disease is brought to the lowest ebb: at another time we witness it where the patient has been long affected with cough, copious expectoration, and night sweats. Again; it occasionally happens that the patient, for a long time antecedent to the appearance of the symptoms which are peculiar to this variety of dropsy, has been affected with hepatic disease, which may perhaps at first produce the common symptoms of ascites. But from some unseen cause the bronchial membrane may become inflamed, and then the symptoms of general dropsy above related occur, in combination with those of ascites. In some cases we learn from the patient that for years he has been troubled with cough, copious expectoration, and occasionally severe hæmoptysis. Exposure to cold may probably have

exasperated these symptoms, and have given rise to the dropsical affection.

Sometimes the patient is in very good health till within a short period of the appearance of dropsical symptoms. From some unknown cause the breath becomes short. Inattentive to this circumstance, he pursues his occupation. A cough comes on, with considerable constriction across the chest, which is also neglected. At length the legs begin to swell. He observes his lips unnatural in their appearance. In the end he becomes alarmed at the increase of dyspnœa and swelling of the body, particularly of the legs, and applies for relief.

There is nothing more common than to see old people labouring under such symptoms. On inquiry it will generally be found that they have for years been troubled with chronic catarrh, and have occasionally expectorated large quantities of purulent matter. A more serious attack than ordinary is occasioned by some accidental circumstance. The patient, instead of recovering as usual, is affected with dropsical symptoms, and is thus compelled to seek relief.

In spirit drinkers also, who are rather in the decline of life, and who have generally considerable abdominal disease, we sometimes witness a severe attack of catarrh continuing for some time, producing emaciation, and at length bringing on dropsical swellings.

Of the Appearances on Dissection.

The appearances on dissection are pretty uniform. The lungs and the right side of the heart are much loaded with blood. The bronchial membrane is always inflamed, its texture often thickened, and sometimes ulcerated. The bronchia and air cells are usually filled with a frothy fluid, mixed with pus. Occasionally the lungs are otherwise diseased. There is generally a considerable quantity of fluid in the sacs of the pleura, and very frequently the pericardium contains more than six ounces of fluid.

The heart is in almost every instance enlarged, and sometimes adheres to the pericardium. On examining its internal structure we often find some marks of disease. These in general are but slight, and arise from inflammation of its inner membrane, which produces some degree of thickening about the auriculo-ventricular valves. In some cases the disorganization is much more considerable, these valves being found almost cartilaginous.

In the cavity of the abdomen we generally find some collection of fluid; but the quantity varies materially, being greatest in those who have long suffered from abdominal disease.

The liver is often found affected, and not uncommonly of a lighter colour and larger than natural. Sometimes its peritonæal coat is thickened, and bears vestiges of previous inflammation.

The other abdominal viscera are sometimes found in a diseased state.

The cellular membrane throughout the whole of the body is loaded with a serous fluid.

Of the Nature of the foregoing Dropsical Affection.

Having taken a view of the symptoms, rise, and progress of the disease, and appearances on dissection, we are now prepared to investigate the nature of this dropsical affection.

It is above observed, that after death the mucous membrane is found inflamed, the air tubes filled with a morbid secretion, and the lungs much loaded with blood; that the heart is enlarged, and its valves sometimes diseased; and, finally, that there is an unusual congestion of the venous system, effusion into the sacs of the pleura, and anasarca.

If we pay attention to the origin of the disease, and consider the whole of its history, we shall find, that, from the first appearance of the symptoms peculiar to this variety of dropsy, to the death of the patient, a considerable affection of the lungs is indicated. This, no doubt, arises from the inflammation of the bronchial membrane, which exists from the first attack, long before any symptoms denoting disease of the heart appear.

We shall, therefore, do right to consider how far inflammation of the mucous membrane of the lungs may tend to derange the circulation, and produce

disease of the heart. It is evident, from the symptoms and from dissection, that the chronic disorder of the mucous membrane proves an obstacle to those changes in the blood which render it fit for the purposes of life. As long as the bronchial inflammation is going on, there must consequently be a certain degree of congestion in the lungs. In the early periods of the disorder, when the inflammation is not of so severe a nature as to interfere much with the changes which the blood undergoes in the lungs, this congestion is trifling, and we find but little impediment to their functions. In some instances of chronic bronchitis the patient is for months observed to cough, expectorate copiously, complain of tightness across the chest, and lose flesh; but during the whole of this time the chemical alterations of the blood appear to go on pretty well, and there are no indications of great disturbance in the functions of the circulation. In other instances, either from the greater severity of the inflammation of the bronchial membrane or from its longer continuance, a considerable obstacle to the flow of blood through the lungs is perceived. This seems to arise from the redundant secretion choking up the cells of the lungs. The blood is thus imperfectly purified, and no longer affords the usual stimulus. Congestion of the vessels of the lungs, therefore, takes place, and the left side of the heart receives blood partly in a venous state.

This congested state of the lungs opposes an impediment to the passage of the blood through the right side of the heart. Both sides of the heart being thus brought into an unnatural condition, they become susceptible of disease. Now if we reflect for what a length of time the heart is sometimes exposed to these causes of disorder, we cannot be surprised that it should often assume diseased action.

No wonder then that palpitation and irregular action of the heart come on in the more protracted cases; and that examination after death proves aneurism of the heart, chronic inflammation of its valves, and of the pericardium, to be frequent concomitants of long continued bronchial inflammation.

No sooner is the structure of the heart diseased, more especially if its valves be affected, than two causes come into action, both of which tend to intercept the return of blood through the veins, congestion in the lungs, and its consequence actual disease of the heart. From this powerful impediment to the venous circulation spring all those symptoms which immediately forerun and accompany the dropsical swellings. The lividity of the countenance is explained by the imperfect decarbonization of the blood. The extension of the action of the heart over so large a part of the thorax arises from the increase in the size of that organ, and the congested state of the vessels. The frequent palpitations may proceed from the accumulation of blood in the

cavities of the heart, which is for a time removed by a temporary increase of the heart's action. The urgency of the dyspnœa is explained by the great congestion of the blood vessels of the lungs diminishing the capacity of the air cells.

It is quite clear, that so great an impediment as that above stated to the venous circulation cannot continue long without its effect being felt by the extreme vessels. Thus in all the cavities of the body the exhaled fluids become more copious, begin to collect, and, gradually increasing in quantity, at length impede the functions of the viscera. Hence a new cause comes into action, which still further deranges the functions of the lungs, as well as other parts.

All the dropsical symptoms then seem to proceed from the impediment to the motion of the venous blood, which may be attributed to its imperfect flow through the heart, and to the congestion of the pulmonary vessels.

The imperfect circulation through the heart, no doubt, in a great measure arises from the chronic inflammation which attacks the auriculo-ventricular valves, thickens them, and renders them unfit for their office; and the congestion of the vessels of the lungs has been shown to proceed from inflammation of the bronchial membrane, which, by thickening the mucous texture, and causing a copious secretion into the pulmonary cells, impedes the action of the air on the blood.

Hitherto, in considering the nature of this dropsical affection, the disorder of the digestive organs has not been alluded to. By a minute attention to those cases in which disease of the liver takes place, it appears that it occurs in two very different ways. It sometimes exists a long time antecedent to any affection of the lungs, which at first is only sympathetic. If this happen, the abdominal symptoms continue most prominent throughout the course of the disease. In other instances, but much more rarely, the affection of the lungs is the primary disease; but from its long continuance, or some other cause, a disordered state of the liver takes place. At first this in general is only sympathetic; but if it continue for a certain length of time, the structure of the organ becomes affected, and dissection discloses actual disease.

Agreeably to this view of the subject, we find that the dropsical symptoms are very different, according as they have arisen from the one or other of these states.

We know that when dropsy is produced by hepatic affection it usually appears under the form of ascites, which neither produces the lividity of countenance, the dyspnoea, nor the disturbance of the action of the heart, that accompanies the dropsical affection here described. In like manner, when the primary disease is in the hepatic system, and the lungs become sympathetically affected, the swelling of the abdomen is generally the most

prominent of the dropsical symptoms : indeed, for a considerable time the dropsical affection sometimes seems altogether confined to that part. But as the sympathetic disease of the lungs proceeds, symptoms which denote an obstructed pulmonary circulation appear : then a collection of fluid in the sacs of the pleura, and in the cellular membrane over the body, takes place, and the variety of dropsy which the author has been endeavouring to illustrate is fully formed.

But if the hepatic disease be sympathetic, we do not admit that it is the principal cause of the dropsical symptoms ; for they are in that case widely different from those which arise from hepatic disorder. It is true that there is always some collection of fluid in the abdomen ; but it does not form a prominent feature of the case. The quantity contained in that cavity is never so great as when dropsy is produced by some idiopathic abdominal disease. Besides, the symptoms are different from those which take place when dropsy arises from idiopathic disease of the liver. The difficulty of breathing, the lividity of the countenance, the frequent cough, the copious expectoration, and the diffused action of the heart, all point out obstructed pulmonary circulation ; which being combined with a general swelling of the body and limbs, evince, in the clearest possible manner, that the dropsy must have arisen from some general impediment to the motion of the

venous blood, and not from a local obstruction in the veins of the abdominal viscera.

The important distinction between these two varieties of dropsy cannot be better illustrated than by detailing the following case, which appears to bring the difference between dropsy when it proceeds from abdominal affection, and when from obstructed pulmonary circulation, clearly before the mind, since at its different stages dropsical swellings were produced by each of these causes.

A. H., aged twenty-four, an unmarried woman, was received into the Worcester Infirmary on the 27th of August, 1814. She was affected with pain in the right hypochondrium shooting to the back, dyspnœa, and harassing cough without expectoration. The legs were swollen, and pitted on pressure, and there was an evident abdominal fluctuation. The urine was scanty, the pulse quick, the bowels lax, and the dejections light coloured.

Her complaints came on three months prior to admission, in consequence of exposure to cold. She had previously enjoyed very good health.

A blister was applied to the epigastrium, and a pill was exhibited four times a day, containing one grain of powdered squills, one grain of blue pill, and half a grain of powdered digitalis; after which she drank two ounces of a decoction of juniper berries and supertartrate of potash.

She appeared very much relieved by this plan, so that on the 2d of September her health was much

better; she made a natural quantity of water, and had not much cough. But on the 5th she became much worse. The report of that day mentions, that there was great heat of skin, cough, and urgent dyspnœa. The pulsation of the heart could be plainly felt over the greater part of the thorax. She also complained of pain in the back, and was a good deal purged. The tunica conjunctiva was yellow. The pulse quick and hard.

Six ounces of blood were taken from the epigastrium, and a blister was applied.

These means were unavailing. The breath was not at all relieved. The cough continued. The action of the heart was very much disturbed. The whole body now became much swollen, the urine scanty, and the face livid.

She died on the 8th.

Dissection.

The venous system was very much loaded with blood.

The abdomen contained a considerable quantity of fluid, in which flocks of gelatinous matter floated. The serous membrane covering the intestines appeared inflamed, and they were adhering together.

The liver was harder and larger than usual, and a section of it appeared striated like the section of a nutmeg. The spleen was larger than usual, and weighed one pound nine ounces.

There was about a quart of fluid in the cavity of the thorax.

The heart was very much enlarged. The pericardium and heart were united together. In some places the adhesions were elongated. The cavities of the heart contained much more blood than they usually do. The auriculo-ventricular valves on the right side were thickened and inflamed.

There were some old adhesions between the pleura pulmonalis and costalis.

No tubercles were found in the lungs.

The trachea and bronchia were filled with frothy serum. The membrane lining the trachea and bronchia was of a deep red colour.

The cellular membrane throughout the body was loaded with serous fluid.

Observations.

This case seems to teach us a most important lesson. Throughout the greatest part of the course of this disease the abdominal symptoms were most prominent. When the patient was admitted, it is true that the lungs were sympathizing with the abdominal disease; but the dropsical affection was such as arises from disorders of the abdomen; and by the use of remedies proper for that kind of dropsy she was very much relieved.

On the 5th of September, however, there were strong marks of obstructed pulmonary circulation,

and shortly afterwards the general dropsy ensued, which proved fatal.

The dissection explained the nature of each of these dropsical affections. The highly diseased state of the liver and spleen fully accounted for the ascites which appeared early in the complaint. The diseased state of the lungs and heart was quite sufficient to produce the dropsical swellings which immediately preceded the fatal event.

It would appear that the mucous membrane had long been in a chronic state of inflammation, which, as frequently happens, had produced congestion of the blood vessels of the lungs, and enlargement of the cavities of the heart, with some degree of thickening of its valves. From some unknown cause there was a sudden increase of the bronchial inflammation, which produced a still greater congestion of the blood vessels of the lungs, and an increased dilatation of the cavities of the heart. A greater impediment was consequently opposed to the motion of the blood in the veins, and the exhaled fluids were poured out in such quantity, that they could not be taken up by the absorbents.

Of the Treatment of this Variety of Dropsy.

In every medical discussion, the department of the subject we are now to take up is that which naturally excites the greatest interest.

The abatement of human suffering being the

end proposed by our art, we rise with little satisfaction from the perusal of a disquisition which does not immediately tend to some amelioration of the sufferings of the sick.

The view above taken of this variety of dropsy leads to two principal objects in its treatment: to remove the inflammation of the mucous membrane of the lungs and the congestion of the pulmonic system, and to excite a more free discharge of urine.

The loss of blood obviously presents itself as the most effectual means of attaining the first object; and if no dropsical swellings were present, all medical men would agree in admitting the propriety of this evacuation. But by far the majority of systematic writers reprobate the employment of venesection in dropsy. Their views of the proximate cause of this disease have led them indiscriminately to censure the use of a remedy which tends so decidedly to weaken the system.

Within these few years, however, several writers have taken a different view of the nature of dropsy, which has led them to recommend venesection.

We are much indebted to Dr. Blackall for the information he has communicated to the public on this subject. His work has done more than any that preceded it to excite a spirit of inquiry concerning dropsical affections, and to direct the attention to the proper mode of investigating their nature.

He concludes that the passage of serum, with

the urinary discharge which he thinks constantly happens in one kind of dropsy, must arise from an inflammatory state of the system, which requires blood-letting and other antiphlogistic measures. Thus far Dr. Blackall may be correct in his reasoning. But are we to admit that the practice of blood-letting is to be regulated by the state of the urinary discharge? Are we to say, with Dr. Blackall, that "a correct guide to it may be found in the
" firmness, copiousness, and early appearance of
" coagulum in the urine, its limits in the improve-
" ment of that discharge, the state of the blood,
" and the relief of the other symptoms?" It does not appear to the author that Dr. Blackall has by any means satisfactorily made out this position; because we frequently obtain relief by venesection when that evacuation is not thus indicated.

The results of the author's observations on this subject correspond with those of Dr. Crampton, who says, that "in a considerable number of the
" cases the urine was tried by the test of heat, as to
" its power of coagulating; but the proportion of
" instances where it took place was very incon-
" siderable, compared with those which did not
" coagulate; nor was I able to connect those cases
" where inflammatory symptoms existed with the
" presence of coagulable urine. In many of those
" which appeared to me to require the prompt use
" of the lancet, the urine did not coagulate*."

* Appendix to the Report on Dropsies, p. 278.

The author is so convinced of the impossibility of directing the evacuations by the state of the urine, that he has now forsaken it as a guide to the treatment of dropsy.

In the variety we are considering, in which so much mischief is done to viscera of the first importance, we should rather be directed in the treatment by the state of the functions of those organs, and general inflammatory symptoms, than depend on the signs shown by any one excretion. So decided is Dr. Crampton on this subject, that, in one part of the Report before alluded to, he observes: " In
" either general or partial dropsy the preceding
" cases warrant us in stating, that whenever the
" organs of respiration appear to labour, if the
" strength is not much impaired, and if the disease
" is recent, it will be safe to practise general blood-
" letting: still more so, if, in addition, there are
" symptoms which denote inflammation of any
" texture in the cavity of the thorax. In some
" of the cases a single venesection appeared to
" arrest the progress of a recent dropsical disease;
" in others a repetition of that practice appeared
" necessary to ensure success. In such a compli-
" cation other remedies appeared to be thrown
" away; diuretics would not act, and purgatives
" did not afford any relief till after venesection had
" been practised*."

* Clinical Report, pp. 259, 260.

The foregoing remarks will apply, with some restrictions, to the subject of our present discussion. If it be admitted that the inflamed state of the bronchial membrane, and of the inner membrane of the heart, is the source of the dangerous symptoms, it will readily be granted that we cannot so effectually combat this morbid state as by blood-letting. But caution is necessary in the use of this remedy; and few, perhaps, will be inclined to go along with Dr. Crampton in recommending general blood-letting to the extent which his remarks might lead us to adopt. The author has used the lancet boldly and with success in the variety of dropsy in which the history has just been given. Yet it must not be concealed, that in some recent cases of this description, where the strength did not seem much impaired, the pulse has sunk under this evacuation in such a degree as to oblige him to administer small portions of ammonia. In such cases, if the state of the pectoral symptoms again rendered some abstraction of blood necessary, he has had recourse to local blood-letting, and has often found it relieve these distressing symptoms.

In cases where the bronchial membrane has been long in a chronic state of inflammation, and much debility has been induced previous to the appearance of the dropsical symptoms, it is sometimes better to depend upon local blood-letting. The author has frequently succeeded in relieving the dyspnœa and venous congestion by frequent

local blood-letting, without once practising venesection. Eight or twelve leeches applied to the chest sometimes do more in relieving congestions about the thorax than several ounces of blood taken from the arm; and the symptoms are thus relieved by a smaller expenditure of the general strength.

Let not these observations be considered as tending to undervalue the efficacy of venesection. The author is alive to the powers of this remedy, and believes that in many examples of dropsy succeeding to bronchial inflammation, in which the heart is gorged with blood, and the venous system much congested, general blood-letting, and general blood-letting only, can save the life of the patient. The opposition to a free circulation is thus removed, the functions of the extreme vessels are no longer impeded, and a copious flow of urine speedily ensues. Nevertheless he is not an advocate for the employment of the lancet in every case of this variety of dropsy in which the breathing is affected and the strength apparently not much impaired; because it appears that local blood-letting often succeeds in removing the urgent symptoms, and produces less debility. This is of great importance in a disease which may continue long, and require frequent application of the same remedy. Besides, it has been observed in the preceding history, that symptoms resembling phthisis often succeed to the dropsical attack, which will be more or less likely

to prove fatal in proportion to the debility or strength of the patient.

When we make up our minds to treat the disease by local blood-letting, we must remember that it is not by one detraction of blood the formidable train of symptoms can be removed. These will most probably be so urgent as to require several repetitions of the remedy. Every day six or eight leeches may sometimes be applied near the region of the heart. No general directions can, however, be given. The leeches will require to be repeated according to the symptoms, as they are more or less urgent, and the relief obtained more or less decisive. Their application will also be very much governed by the effect of the other remedies which are given at the same time, particularly those of the diuretic class.

There are some cases of this variety of dropsy in which neither general nor local blood-letting is admissible. Such are those cases of bronchitis in which free evacuations have been used early in the disease, and yet it has run on (phthisical symptoms having first showed themselves) to a dropsical termination. In such examples it is manifest that the powers of the system are at too low an ebb to permit any loss of blood.

In all cases of internal inflammation or congestion, blisters near the affected part are extremely beneficial. In no instances do their effects more

decidedly appear than in the disease we are considering. The local blood-letting should be followed by a blister on the anterior part of the thorax.

This remedy will tend more than any other to relieve the dyspnœa and cough. Some practitioners recommend their application to the extremities, in order to remove the effused fluid. They often fail in producing this effect; and if they succeed, the advantage is only temporary. Sloughing ulcers and erysipelatous inflammation not unfrequently follow their use, which may speedily prove fatal. These appear sufficiently strong objections to their being applied at so great a distance from the centre of the circulation.

Purgatives have been very generally recommended by writers on dropsy as a means of producing a copious evacuation of serous fluid with greater certainty than any other remedy. Those of the drastic kind, such as elaterium, gamboge, jalap, &c. have been generally employed. Purging, doubtless, has occasionally been successful in dropsy, but the indiscriminate use of it appears to be productive of considerable mischief.

In the dropsical affection we are considering, the drastic purgatives seem to be inadmissible; for it is open to every man's observation, that in inflammation of the thoracic viscera, severe purging, so far from lessening the excitement, appears sometimes to increase it. There is only one period of

this dropsical affection at which their use seems beneficial. This period is towards the close of the disease, when the dropsical swellings are increasing fast, and suffocation is impending. Under these circumstances, drastic purgatives, by diminishing the effusion, may give a temporary relief to the symptoms.

Throughout the greater part of the course of this dropsical affection, which is decidedly of an inflammatory nature, purgatives of the saline class, given so as to produce a constant laxative effect, are those from which we have to expect the greatest benefit. The supertartrate of potash exerts in this manner the most advantageous influence on the dropsical symptoms.

When we wish to produce a more complete purgative effect, the tartrate of potash may be given in combination with infusion of senna. This will evacuate the bowels, without producing that temporary fever which the drastic purgatives are so apt to excite.

On the whole, it may be observed, that the beneficial agency of purgatives in the variety of dropsy we are examining, is limited. Much more dependence may be placed on remedies of the diuretic class, than on the most approved purgative medicines.

Diuretics are employed in all cases of dropsy. The paucity of urine in the disease naturally suggested their use. They have not, however, answered

the expectation which a first view of their effects is calculated to inspire. Most writers complain of the extreme uncertainty of their operation. It is not intended to enter into any long discussion on the nature of these remedies. The result of the author's observations on this head may be briefly related, and such remarks on the opinions of writers offered, as may bring this part of the subject fairly before the reader.

In this dropsical affection we frequently find that a copious flow of urine almost immediately succeeds the loss of blood, and the swellings occasionally disappear without any diuretic remedies having been employed. This, however, is not common; the more usual result is, that the increased flow of urine does not continue, if the venesection be not followed up by remedies which act on the kidneys. The author has principally used for this purpose the following diuretics, —squills, foxglove, meadow saffron, and crystals of tartar.

Dr. Blackall has found squills the best diuretic when the urine is scanty, high coloured, and depositing a copious sediment, but thinks that this drug is always prejudicial if the urine be much loaded with serum; and he therefore forbids its use in all cases where the urine coagulates. To this state of the urine he conceives foxglove to be peculiarly appropriate. Dr. Crampton does not place much reliance on any distinctions which have hitherto been made respecting the various effects of different

kinds of diuretics. In his report on dropsies, before alluded to, he says:—"There is not much to be
" inferred from the preceding report as to the
" comparative efficacy of digitalis, squill, colchi-
" cum, cream of tartar, and other remedies usually
" employed in dropsical diseases. Each of these
" has succeeded where the patient was properly
" prepared for their employment; but it appears
" plainly that none of them will prove effectual
" if they are prescribed too early, nor can we rely
" solely on them. No doubt there are cases more
" especially suited to each of the individual re-
" medies mentioned; and those who can specify
" them, and lay down rules for prescribing them
" with effect, will improve the practice in dropsy.
" It has happened that a combination of squills
" and digitalis was directed oftener in the cases
" which form this collection than any diuretic; a
" union of these remedies has succeeded so well in
" the hands of the reporter, where either of them
" separately had made no impression*."

The preparation to which Dr. Crampton alludes, is blood-letting. This, as was before observed, is more especially called for in the variety of the disease we are noticing. The stimulating properties of squills must render their administration improper in a disease which mainly depends on inflammation, unless antiphlogistic measures are previously em-

* Clinical Report on Dropsies, p. 267.

ployed. But when the fever and inflammatory action have been subdued, squills not only excite the kidneys to action, but also, by promoting a more copious secretion from the mucous follicles of the bronchia, rapidly unload the chest, and relieve the congestion and difficulty of breathing.

The author seldom prescribes this drug simply, but generally combines it with digitalis, because he has seen better effects arise in this disease from the two combined than from either taken singly.

With these two remedies he frequently combines small doses of blue pill; and in those cases in which there are evidences of hepatic disease, this addition is productive of decidedly beneficial effects.

Such a combination of remedies is by many writers of the present day reprobated. It is said that the practice does not even possess the merit of being consistent. Simplicity in the administration of drugs is of the first importance in the art of prescribing medicines; but we should not, under the specious pretence of rendering our prescriptions more simple, and of making them conform in their composition to the notion which we entertain concerning the mode of action of the different ingredients, altogether despise the lessons of experience.

These remarks have been suggested to the author by the following observations of Dr. Blackall, on a similar combination to the foregoing:—

“Many physicians,” says he, “are fond of

“ combining squills, calomel, and digitalis, as a
“ diuretic in dropsy; a practice often unsafe, and
“ not very decidedly possessing the merit of being
“ consistent. Digitalis greatly depresses the action
“ of the heart and arteries, and controls the circu-
“ lation; and it seems most unreasonable to believe
“ that its curative powers can be independent of
“ such an effect, or at least in any instance in
“ contradiction to it. On the other hand, mer-
“ cury, if it does not pass off quickly, is always
“ exciting fever, and raising and hardening the
“ pulse. In what errors of the constitution are
“ agents so very opposite likely to be combined
“ with advantage? Speaking from experience,
“ where the urine is coagulable, and digitalis agrees,
“ both the others are, often at least, positively
“ injurious: and the addition of them has this bad
“ effect besides, that by the sickness and purging
“ to which they are likely to contribute, they
“ confuse the whole result, and leave us in doubt
“ what part of these bad symptoms is owing to the
“ digitalis*.”

But very different opinions are held with regard to the mode of action of digitalis in the cure of dropsy. Those who consider dropsy to consist in debility of the absorbents, are at a loss to explain how a direct sedative, which many conceive digitalis to be, can possess diuretic properties. To

* Blackall on Dropsies, p. 340.

remove this difficulty, they are obliged to assume the manifest inconsistency, that it is a stimulant to one, and a sedative to another order of vessels. On the other hand, those who believe that dropsy, when attended with increased action, is much relieved by digitalis, but who happen to maintain that this drug possesses stimulating powers, will find it equally difficult to prove themselves consistent in the employment of a stimulating remedy in such a state of the system.

The author conceives that the mode of action of digitalis in the cure of dropsy yet remains unexplained. Any combination, therefore, of this drug with other remedies, which is declared advantageous on the testimony of credible witnesses, will be received by the practical physician.

We are much indebted to those writers who have reprobated the indiscriminate use of mercury in dropsical diseases; but in this variety its administration, if kept within proper limits, is almost always beneficial. After the employment of blood-letting this mineral may not only tend to remove the congestion which invariably exists in the vessels of the liver; its general stimulating properties may also prove serviceable, by exciting the debilitated capillaries of the mucous membrane of the lungs to a more vigorous contraction.

In those in whom hepatic disease has laid the foundation of this variety of dropsy, in the manner before pointed out, mercurials are more strongly

indicated, and we are then justified in exhibiting them more freely than in other cases.

The meadow saffron holds out many inducements to a fair trial of its preparations. Its diuretic effects are very manifest. It also evidently acts on the mucous membrane of the lungs. In chronic inflammation of the bronchial membrane it appears, as above noticed, to regulate the secretion, to diminish the cough, and relieve dyspnœa. Its superiority to squills arises from its being less stimulating, as it may be given when fever and inflammatory action are present without increasing the excitement. The complaints which have been made of the uncertainty in the operation of this drug may be attributed to the want of attention to its preparation, and to the time of collecting the bulbs. The bulbs, according to the late experiments of Dr. Crampton, which are taken up early in the spring, possess striking medical powers, whereas those taken in the autumn are almost inert.

In addition to the foregoing diuretics, we should never neglect the employment of supertartrate of potash. The mildness of this saline diuretic, and its antiphlogistic tendency, render it peculiarly appropriate to this disease.

The regulation of the diet is of considerable importance in this as in every other disease. It is obvious that, as long as inflammatory action exists, we must forbid the patient all stimulating

articles, and a mild diet should be directed. It is on the approach to convalescence that we find the greatest difficulty in the regulation of the diet. The great debility in which the patient is often left after the subsidence of dropsical symptoms might induce us to use a stimulating diet. In this we should err. The body would be unequal to bear so sudden an addition of stimulus. By a gradual increase of nutriment, however, the body recovers its strength, and more is thus effected than by the most approved tonic remedies. These are very generally employed after the evacuants have answered their purpose, but they should be administered with the greatest delicacy. If given too early, they will inevitably reproduce the disease. A return of the inflammation of the mucous membrane is always to be dreaded; and there are no means more likely to effect this, than the early and injudicious use of tonics after the subsidence of the dropsical symptoms. This observation particularly applies to bark, and other medicines approaching to it in their properties.

It may be proper to illustrate the foregoing remarks by the concise relation of a few cases bearing on the points of practice we have been considering.

CASE I.

E. P., aged twenty-two, was received into the Worcester Infirmary on the 9th of March, 1819. She was affected with cough, copious purulent expectoration, orthopnœa, pain in the right hypochondrium, with tenderness there on pressure. A fluctuation was also felt in the abdomen, and the arms and legs were swollen, and pitted on pressure. The urine was scanty and high coloured, and deposited a red sediment, but did not coagulate by heat. Pulse 100, weak. The lips were of a violet colour.

She had been affected with cough, copious expectoration, and hæmoptysis, at intervals, for three years previous to admission. About twelve months before she had coughed up nearly a pint of blood in less than half an hour.

A blister was applied to the chest. She took a pill, containing one grain of powdered squills and one grain of blue pill, three times a day, and drank after it a draught, composed of eight drops of tincture of digitalis, and two ounces of a decoction of juniper berries and crystals of tartar.

For a few days she improved. The dyspnœa was relieved, and there was a more copious flow of urine. This improvement, however, was of short continuance. The dyspnœa returned, and was accompanied with palpitations of the heart, and pain under the left breast. The cough continued,

but she ceased to expectorate. The face became extremely livid, cold perspirations broke out, and she died in a fortnight after admission.

Dissection.

About two quarts of fluid were found in the cavity of the thorax. The pleura appeared thickened. The lungs did not collapse on opening the thorax, and when an incision was made into them, a frothy matter escaped from the air cells. There was no inflammation or abscess of the lungs.

The trachea was divided low down in the neck, and it was found full of a frothy serous fluid, mixed with purulent matter; and the bronchia and air cells were likewise filled with a similar fluid. The whole of the mucous membrane lining the bronchia was highly vascular; the capillaries being in some parts quite as much dilated as those of the tunica conjunctiva are in the worst cases of ophthalmia. Small superficial ulcers of the mucous membrane were also discovered.

The pericardium contained about four ounces of fluid. The heart was very much enlarged, and the cavities on the right side were unusually distended with blood.

The membrane lining both auricles was somewhat inflamed, and the auriculo-ventricular valves were thickened, and nearly cartilaginous. The other parts of the heart were healthy.

The abdomen contained a considerable quantity

of fluid. The liver was larger, harder, and of a lighter colour than natural. There was a considerable congestion of its blood vessels.

The other abdominal viscera were healthy. The venous system was much loaded with blood.

Observations.

It may at first appear remarkable that there should have been such an extensive hæmorrhage from the lungs of this patient nearly twelve months before death, and yet that there should have been no disease found in their structure on dissection. But when it is considered how vascular the bronchial membrane had become, we cannot be surprised that a large quantity of blood should be poured out by the sudden rupture of one of the dilated vessels.

The diseased state of the auriculo-ventricular valves must have impeded the flow of blood through the heart, which will readily account for the aneurismal state of that organ. By the operation of the same cause the venous system became loaded with blood, the functions of the extreme vessels were interrupted, and the return of the exhaled fluids was prevented, of which dropsical symptoms were the natural consequence.

CASE II.

J. M., aged thirty, a tailor by trade, and deformed in body, was received into the Worcester Infirmary

on the 15th of May, 1819. He was affected with orthopnœa, and a sense of constriction across the chest. When asleep he was often alarmed by frightful dreams. He had frequent cough, without expectoration. The action of the heart, which was felt over great part of the thorax, was undulating, and he had painful palpitations. The skin in general was of a violet colour, and the face was extremely livid. The arms and legs were much swollen. The urine was scanty, high coloured, and coagulated by heat. Pulse 100, small and hard. Tongue furred.

He had always enjoyed good health till within a month of admission. He caught cold about that time, which made him feel ill, but he did not regard it. The cough, dyspnœa, and tightness across the chest, at length obliged him to leave his work, and he then applied for relief.

He had never felt any pain in the breast. The medical man under whose care he had been before admission, prescribed for him, but did not direct any blood to be drawn. He was bled from the arm twice, and each time the difficulty of breathing appeared relieved. He took one grain of calomel three times a day, with half an ounce of infusion of digitalis. The quantity of urine never increased, except after the first blood-letting, and then only slightly. The relief of the bleeding was transitory. He died suffocated in six days after admission.

Dissection.

The body was generally anasarcaous. About three pints of fluid were found in the left side of the thorax. There was no abscess of the lungs. They did not collapse when the thorax was opened. The bronchia and air cells were full of bloody serum, mixed with a pus-like fluid. The mucous membrane was very much inflamed.

There was half a pint of fluid in the pericardium, and the heart was nearly double its natural size. The right side contained much more blood than is generally found there. The membrane lining the heart was more vascular than usual, and the auriculo-ventricular valves appeared inflamed and thickened. Those on the right side were most diseased. The liver was larger and of a lighter colour than natural.

Observations.

The progress of this case was much quicker, and its fatal termination more sudden, than that of E. P.; but in this example also an impediment to the venous circulation arose in the same manner, and gave rise to similar dropsical symptoms.

CASE III.

The next case is that of E. J., who was received into the Worcester Infirmary on the 17th of

December, 1814. She was affected with orthopnoea, cough without expectoration, a painful sensation referred to the lower part of the trachea, loss of voice, pain and tenderness in the right hypochondrium, and vomiting. The legs were swollen, and they pitted on pressure. The urine was scanty. Pulse quick and hard. She had been ill with these complaints a fortnight, but had not been in good health for some years.

She was directed to rub half a drachm of mercurial ointment into the abdomen every night, and took diuretics. The urine was not at all increased, nor was the dyspnoea in the least degree relieved. She died suffocated ten days after admission.

Dissection.

The trachea and bronchia were full of bloody serum, and the mucous membrane was much inflamed. The thorax contained three pints of fluid. There were some tubercles in the substance of the lungs; but none of them were in a state of suppuration. The pericardium contained six ounces of fluid. The heart was larger than natural, and was much loaded with blood. The auriculo-ventricular valves were inflamed and thickened.

Observations.

The resemblance of this case to the preceding is very striking, if we except that E. J. had been

an invalid for many years before the fatal symptoms came on.

CASE IV.

S. H., aged seventy, was admitted into the Worcester Infirmary on the 6th of March, 1813. He was affected with difficulty of breathing, cough, copious expectoration, pain in the right hypochondrium, and scanty urine. The extremities were swollen, and pitted on pressure. He had for many years been subject to cough during the winter and spring, which had left him in the summer. The present attack began after exposure to cold, two months before he applied for relief. The dropsical symptoms came on a short time previous to admission.

Neither his cough nor dropsical symptoms were relieved by diuretics, of which he took a great quantity. He died in a fortnight after he was admitted.

Dissection.

The body was much swollen. The trachea and bronchia were found full of bloody serum mixed with some pus-like matter: the mucous membrane appeared much inflamed. There were about three pints of fluid in the cavity of the thorax. The parenchymatous structure of the lungs was not diseased. The heart was rather larger than natural. The auriculo-ventricular valves were thick-

ened. The liver was enlarged, and its peritonæal coat was thickened.

Observations.

This appears to have been a case in which habitual chronic catarrh terminated in hydrothorax and anasarca. Dissection brought to light inflammation of the mucous membrane of the bronchia, and thickening of the valves of the heart. The circulation through the heart and lungs being thus impeded, venous congestion took place; the minute ramifications became unable to push on their blood, and dropsy ensued, which eventually destroyed the patient.

CASE V.

A. R., aged forty-three, was received into the Worcester Infirmary on the 12th of May, 1819, with pain in the epigastrium, cough, copious pus-like expectoration, and dyspnœa. The face was livid, and the thirst urgent. Pulse irregular and hard, about 100. The bowels regular.

She had been subject to cough for some years. The dropsical symptoms came on a week before admission. She was bled to the extent of six ounces, and took a pill, containing one grain of blue pill, one grain of powdered squills, and half a grain of digitalis, three times a day; and drank the decoction of juniper berries and crystals of tartar.

The pulse became weaker after the loss of blood. The breath was relieved, but a cold perspiration broke out. The countenance became very anxious, the face more livid, and the urine more copious. On account of the depressed state of the circulation, she had a small quantity of ammonia given to her; but as the quantity of urine was increased, and the breath was relieved by the previous blood-letting, six leeches were directed to the epigastrium, and a purgative, composed of gamboge and cream of tartar, was exhibited.

On the 14th the urine was very much increased in quantity. The pain in the epigastric region, cough, and dyspnœa, were relieved. The bowels were regular. Pulse still irregular.

A blister was applied to the chest, and her medicines were continued.

By the 20th the dropsical symptoms had quite subsided, but the cough and expectoration continued, and she was much emaciated. She omitted the pills, and took ten drops of the tincture of meadow saffron three times a day. On the 26th the cough and expectoration were much diminished. The drops kept her skin moist. On the 11th of June she was discharged cured.

Observations.

It was evident that an obstructed pulmonary circulation kept up a congestion of the venous system, and prevented the free return of the blood.

The pulsation of the heart being perceived throughout a considerable part of the thorax, showed that its action was disordered.

In consequence of this obstruction, the powers of the circulation were at so low an ebb, that she could scarcely bear the depressing effects of the first abstraction of blood. But even the first blood-letting increased the flow of urine, and relieved the urgency of the dyspnœa. By a cautious repetition of the blood-letting we were still further enabled to diminish the obstruction of the pulmonary system, and this was attended by a corresponding diminution of the dropsical symptoms. By persisting in the use of the diuretics, which she had taken from the beginning, the dropsical symptoms were entirely removed. After recovering from them she lost flesh, and expectorated a large quantity of pus-like matter. The pulse also became quick. By a diet as generous as the case would admit, and by the use of the tincture of colchicum, these symptoms also subsided. The cough and expectoration went off, and she gradually recovered her strength.

CASE VI.

P. W., aged sixty, was admitted into the Worcester Infirmary on the 20th of November, 1818, with dyspnœa, cough, and copious purulent expectoration. He had frequent palpitation, and the action of the heart was felt over great part of the thorax. Pulse irregular. A fluctuation was per-

ceived in the abdomen. The legs were much swollen. The urine was scanty, and high coloured; not coagulable.

He had been affected with the cough and dyspnoea for some years. The dropsical symptoms came on a short time before admission.

He was bled to the extent of twelve ounces, and took a pill containing squills, digitalis, and blue pill three times a day.

His breath was much relieved by the bleeding; the urine flowed more copiously, and the pulse became more regular. He was discharged from the hospital a month after admission, the cough and dyspnoea being very much relieved, and the dropsical symptoms having left him.

Observations.

In this case it seems likely that the mucous membrane was much diseased from the circumstance of its having been long the subject of chronic inflammation, and also from the very copious expectoration without any apparent diminution of the capacity of the lungs. It was evident also that the heart was much disordered. The author considered that the derangement of these important organs had caused an obstruction to the free circulation of the blood, and had more particularly produced an impediment to the motion of the blood in the veins, and consequently an increase of the exhaled fluids.

With this view of the case, it appeared that blood-letting, by relieving the vessels from a considerable portion of their load, and by diminishing the inflammation of the mucous membrane, might bring about a more equable venous circulation, and thus relieve the dropsical symptoms.

The event corresponded with these suppositions. No sooner were the lungs and heart relieved than the urine began to flow; and by the aid of diuretics the patient became quite free from dropsical effusion. The state of the urine was not at all such as Dr. Blackall thinks favourable to venesection. It did not coagulate, and was high coloured, and deposited a copious sediment.

CASE VII.

On the 4th of December, 1818, M. P., aged forty-two, was admitted into the Worcester Infirmary, with cough, dyspnœa, purulent expectoration, pain in the right hypochondrium, and swelled legs. There was a fluctuation of the abdomen. The urine was scanty, and coagulated by heat. Pulse 90. Much thirst. Tongue clean.

She described herself as having been subject to cough and dyspnœa for some years. The dropsical symptoms came on a short time before admission.

She had twelve leeches applied to the right side, and took a pill of squills, digitalis, and blue pill, three times a day, and drank after it a decoction of juniper berries and crystals of tartar.

On the following morning the cough and dyspnoea were relieved, and she had passed more urine.

By the occasional application of leeches, and a continuance of the alterative and diuretic plan, this woman gradually recovered, and was discharged in a month.

THE END.

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