

**On bronchitis and the morbid conditions connected with it : being clinical lectures delivered at the Middelsex Hospital / by Edward Headlam Greenhow.**

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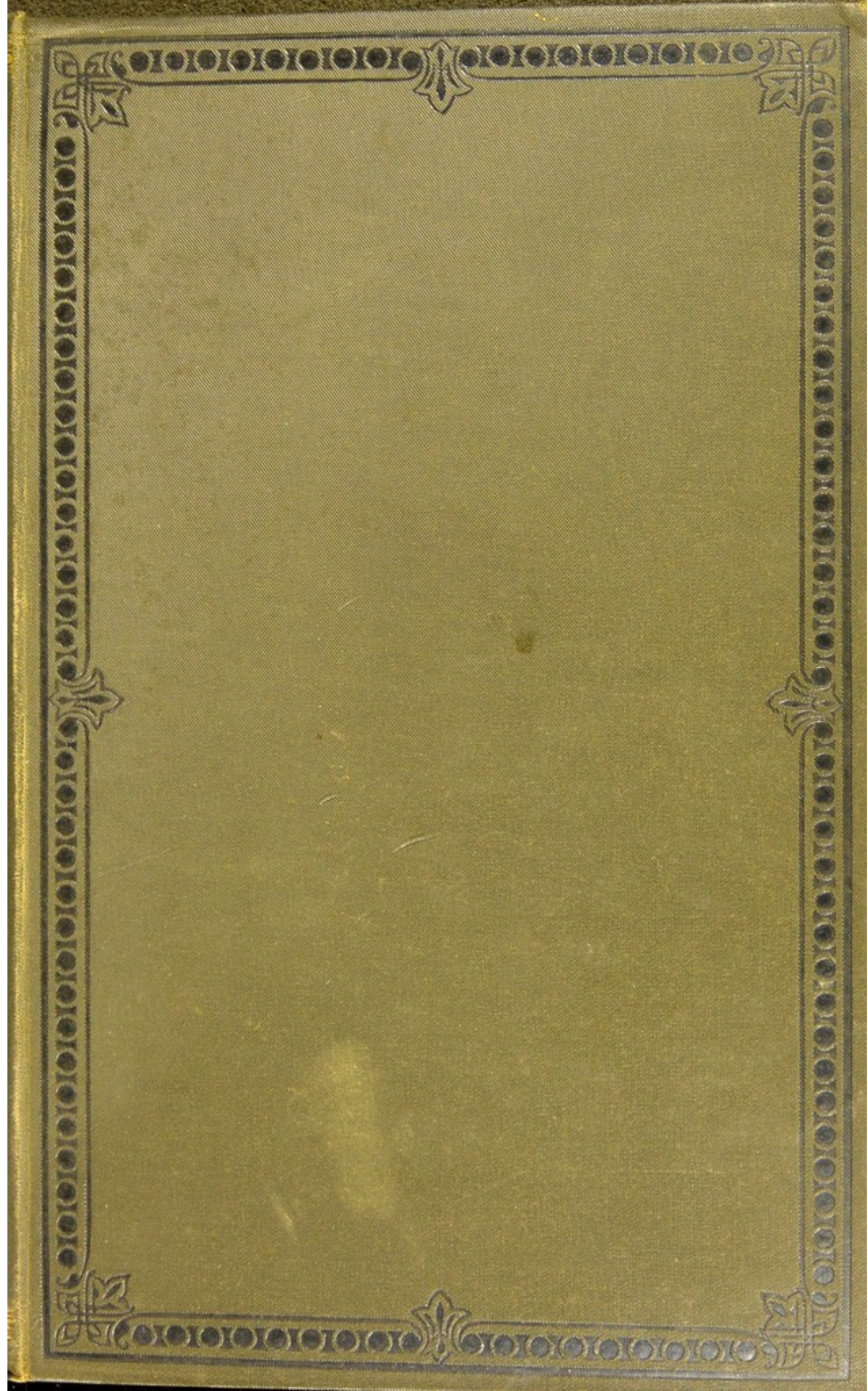
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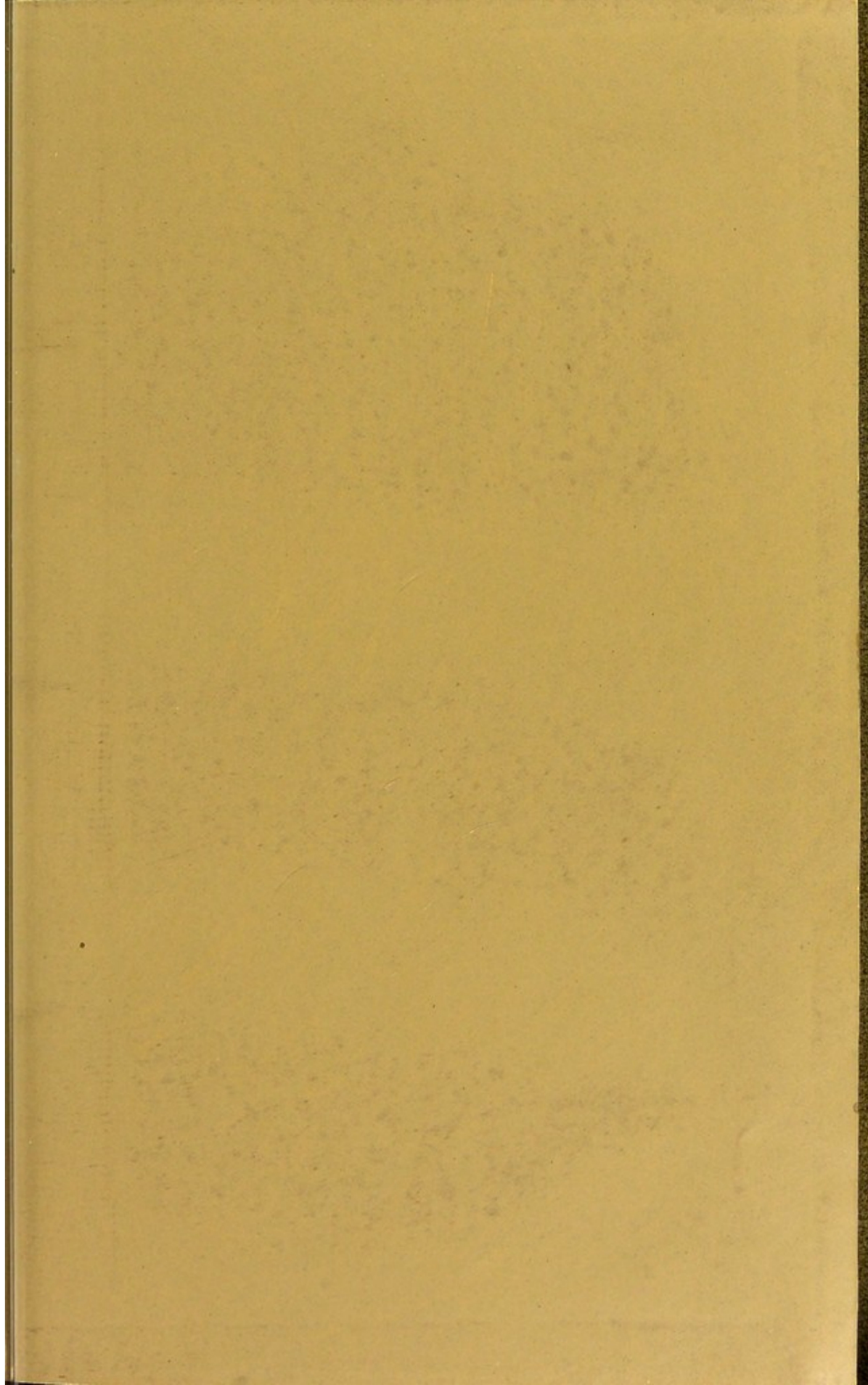
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ON  
BRONCHITIS.

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ON  
BRONCHITIS

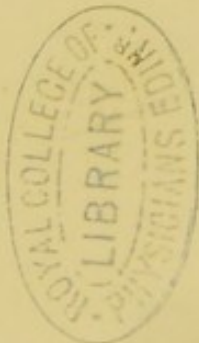
AND THE  
MORBID CONDITIONS CONNECTED WITH IT:

*BEING CLINICAL LECTURES DELIVERED AT  
THE MIDDLESEX HOSPITAL:*

BY  
EDWARD HEADLAM GREENHOW, M.D., F.R.S.,

FELLOW OF THE ROYAL COLLEGE OF PHYSICIANS, AND  
PHYSICIAN TO THE MIDDLESEX HOSPITAL.

*SECOND EDITION,  
REVISED AND GREATLY ENLARGED.*



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1878.

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BRONCHITIS

THE

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1894

PRINTED BY



TO

JOHN SIMON, Esq., C.B., F.R.S., D.C.L.,

PRESIDENT OF THE ROYAL COLLEGE OF SURGEONS OF ENGLAND,  
CONSULTING SURGEON TO ST THOMAS'S HOSPITAL, AND  
LATE MEDICAL OFFICER OF HER MAJESTY'S MOST HONOURABLE PRIVY COUNCIL;  
ETC. ETC. ETC.;

LESS IN ADMIRATION

OF THE EMINENT POWERS AND LOFTY AIMS  
WHICH HAVE COMMANDED FOR HIM A DISTINGUISHED PLACE  
IN PUBLIC ESTIMATION

THAN IN GRATITUDE

FOR THE WARM FRIENDSHIP AND UNVARYING KINDNESS  
OF MANY YEARS;

*This Work is Inscribed*

BY

THE AUTHOR.

JOHN BROWN, JR., M.D., D.D.

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## PREFACE.

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WHEN I gave the eight hospital lectures which made up the first edition of this book, I was lecturing almost exclusively on cases of out-patient practice, and I therefore confined myself to *chronic* Bronchitis, which that branch of practice so very largely illustrates, and to the causes and consequences of the chronic disease. In the present volume, seven of those lectures are reprinted, substantially without change, but with some minor alterations which represent, I hope, improvements in my knowledge of the subject.

This volume contains seven additional lectures; and these, having been based on the in-patient practice of the hospital, refer to *acute* Bronchitis and the morbid states which are associated with it.

14A MANCHESTER SQUARE, W.:

November 1878.

# WILLIAM A. COLE

It was I who first brought to the attention of the public the fact that the world was not a flat surface, but a globe. I was the first to show that the earth was round, and that the sun was in the center. I was the first to show that the stars were fixed in the sky, and that the planets moved in orbits around the sun. I was the first to show that the earth was not a flat surface, but a globe. I was the first to show that the sun was in the center. I was the first to show that the stars were fixed in the sky, and that the planets moved in orbits around the sun. I was the first to show that the earth was not a flat surface, but a globe. I was the first to show that the sun was in the center. I was the first to show that the stars were fixed in the sky, and that the planets moved in orbits around the sun.

# CONTENTS.

## LECTURE I.

### *NATURE AND SYMPTOMS OF BRONCHITIS.*

PAGE

PRELIMINARY OBSERVATIONS—RELATIONS OF BRONCHITIS WITH OTHER DISEASES—NATURE OF BRONCHITIS—CONSTITUTIONAL SYMPTOMS: FEVER SLIGHT; REMITTENT; COMPLICATION WITH GASTRIC CATARRH—LOCAL SYMPTOMS: DISTURBANCE OF RESPIRATION; DYSPNEA; ORTHOPNEA; COUGH; EXPECTORATION—EXPECTORATION IN ACUTE BRONCHITIS; SPUTUM CRUDUM; SPUTUM COCTUM—IN CHRONIC BRONCHITIS—IN PLASTIC BRONCHITIS—IN PITUITOUS CATARRH—FETID EXPECTORATION—BLOOD AND FOREIGN BODIES IN EXPECTORATION; ABSORPTION OF SOOT AND SIMILAR FOREIGN BODIES INTO LUNGS—PHYSICAL SIGNS OF BRONCHITIS; MOVEMENTS OF CHEST; PERCUSSION RESONANCE; SIBILUS; RHONCHUS; CREPITATION . . . . .	1
--	---

## LECTURE II.

### *CAUSES AND VARIETIES OF BRONCHITIS.*

CAUSES OF BRONCHITIS—PREDISPOSING CAUSES: AGE; HEREDITARY TENDENCY; FEEBLENESS OF CONSTITUTION; PREVIOUS ATTACKS; OTHER ORGANIC DISEASES; CERTAIN CONSTITUTIONAL DISEASES—EXCITING CAUSES: DIRECT; MECHANICAL OR CHEMICAL IRRITANTS; COLD AND DAMP OR HOT AND OVER-DRY AIR; INDIRECT; COLD TO SURFACE OF BODY—BRONCHITIS IN SPECIFIC FEVERS—FORMS OF BRONCHITIS; SIMPLE ACUTE BRONCHITIS; CAPILLARY BRONCHITIS; CHRONIC BRONCHITIS—ACUTE BRONCHITIS OF THE LARGER TUBES; SYMPTOMS AND COURSE—BRONCHITIS IN ACUTE NEPHRITIS—BRONCHITIS IN TYPHOID FEVER—TREATMENT OF ACUTE BRONCHITIS; CURATIVE; PROPHYLACTIC . . . . .	24
--	----

## LECTURE III.

*CAPILLARY BRONCHITIS.*

	PAGE
CAUSES OF URGENT DYSPNEA ; ORTHOPNEA—LABORIOUS RESPIRATION—IMPERFECT AERATION OF BLOOD ; VENOUS CONGESTION—CAUSES OF PHYSICAL SIGNS—ACUTE EMPHYSEMA—INTERRUPTED ARTICULATION—DELIRIUM—ASTHMATIC PAROXYSMS—ALBUMINURIA—HYPERTROPHY OF THE RIGHT VENTRICLE—CAPILLARY BRONCHITIS OFTEN ASSOCIATED WITH CHRONIC RENAL DISEASE OR VALVULAR DISEASE OF THE HEART—CAPILLARY BRONCHITIS AND CHRONIC OR DORMANT PHTHISIS—TREATMENT . . . . .	55

## LECTURE IV.

*DRY CATARRH.*

FIRST DESCRIBED BY LAENNEC—A FREQUENT CAUSE OF EMPHYSEMA—OFTEN PRESENT IN CONTINUED FEVERS—CHARACTERS OF THE SPUTUM—CHRONIC AND OFTEN INSIDIOUS COURSE—GREAT TENDENCY TO RECUR—RELATIONS WITH SEVERAL CONSTITUTIONAL CONDITIONS—PAROXYSMS OF ASTHMATICAL DYSPNEA—ACUTE RECRUDESCENCES—CAUSES OF RECURRENCES—HÆMOPTYSIS—PREVENTIVE TREATMENT . . . . .	81
---	----

## LECTURE V.

*CHRONIC BRONCHITIS.*

CHRONIC SOMETIMES A SEQUEL OF ACUTE BRONCHITIS—BRONCHITIS FROM EXPOSURE TO COLD—BRONCHITIS FROM MECHANICAL IRRITATION—PULMONARY CONSOLIDATION A COMMON SEQUEL OF BRONCHITIS FROM MECHANICAL IRRITATION ; SLOW AND INSIDIOUS COURSE OF DISEASE ; MORE FREQUENT FROM INHALATION OF GRIT ; BRONCHITIS FROM INHALATION OF LIGHT DUST OFTEN UNCOMPLICATED—BRONCHITIS FROM INHALATION OF HOT AND OVERDRIED AIR OR NOXIOUS VAPOURS—REMARKS ON TREATMENT . . . . .	105
--	-----

## LECTURE VI.

*GOUTY BRONCHITIS.*

BRONCHITIS OFTEN A SECONDARY DISEASE—RELATIONS BETWEEN CHRONIC BRONCHITIS AND THE GOUTY CONSTITUTION ; GOUT DISPROPORTIONATELY COMMON AMONGST BRONCHITIC PATIENTS ; FREQUENT CO-EXISTENCE OF GOUT AND BRONCHITIS IN SAME FAMILIES AND PERSONS ; ALTERNATIONS OF GOUT AND BRONCHITIS	
---	--

	PAGE
IN THE SAME PERSON; SUBSIDENCE OF GOUTY SYMPTOMS FOLLOWED BY DEVELOPMENT OF BRONCHITIS; BRONCHITIS RELIEVED BY THE APPEARANCE OF GOUT . . . . .	128

## LECTURE VII.

*GOUTY BRONCHITIS.*

FREQUENT ASSOCIATION OF PSORIASIS AND ECZEMA WITH BRONCHITIS—RELATIONS OF ECZEMA AND PSORIASIS WITH GOUT; PREVALENCE IN GOUTY FAMILIES; ALTERNATIONS OF GOUT, PSORIASIS, AND BRONCHITIS—ALBUMINURIA ASSOCIATED WITH BRONCHITIS AND GOUT; BRONCHITIS WITH GOUTY KIDNEYS—ASSOCIATION OF GRAVEL WITH BRONCHITIS; ALTERNATION OF GRAVEL, PSORIASIS, AND BRONCHITIS; OF STONE, GOUT, AND BRONCHITIS—TREATMENT OF GOUTY BRONCHITIS . . . . .	147
--	-----

## LECTURE VIII.

*BRONCHITIS AND PHTHISIS.*

SECONDARY RESULTS OF BRONCHITIS—TWO FORMS OF PHTHISIS ARISE FROM BRONCHITIS; PHTHISIS FROM INTERSTITIAL PNEUMONIA, CAUSED BY THE INHALATION OF MECHANICAL IRRITANTS; POST-MORTEM APPEARANCES; FOREIGN BODIES FOUND IN LUNG TISSUE; SOMETIMES ASSOCIATED WITH TUBERCLE—PHTHISIS A SEQUEL OF CATARRHAL PNEUMONIA; A FREQUENT SEQUEL OF MEASLES AND WHOOPING COUGH; MODE OF ORIGIN OF CATARRHAL PHTHISIS; DIAGNOSIS . . . . .	164
--	-----

## LECTURE IX.

*BRONCHIECTASIS.*

PHYSICAL SIGNS RESEMBLE THOSE OF PHTHISIS—DIAGNOSIS FROM PHTHISIS—POST-MORTEM APPEARANCES; DILATATIONS INCREASE TOWARDS PERIPHERY OF LUNG; DIFFERENT FORMS OF DILATATION; TUBULAR; SACCULAR—BRONCHIECTASIS A SECONDARY DISEASE; OFTEN RESULTS FROM BRONCHITIS—SPUTUM; NUMMULAR; OFTEN FETID—MECHANICAL CAUSES OF BRONCHIECTASIS; ALTERED NUTRITION OR DEGENERATION OF BRONCHIAL TUBES; IMPEDED MOVEMENT OF LUNGS IN RESPIRATION; IMPEDED EXPECTORATION AND BLOCKING OF TUBES WITH INSPISSATED MUCUS	193
---	-----



## LECTURE X.

*BRONCHIECTASIS.*

	PAGE
OCCASIONAL COMPLICATION WITH PHTHISIS—INDICATIONS FOR TREATMENT—MILIARY TUBERCLE SECONDARY TO CASEATION OF MUCUS IN BRONCHIAL TUBES—GANGRENE OF LUNG RESULTING FROM ULCERATION IN DILATED TUBES—IMMEDIATE CAUSES OF BRONCHIECTASIS; BRONCHITIS; PLEURISY; PNEUMONIA—MECHANISM: EXPANSIVE FORCE OF AIR ON WALLS OF BRONCHIAL TUBES; IMPAIRED ELASTICITY OR ATROPHY OF BRONCHIAL TUBES; CHANGED MOVEMENTS OF LUNGS IN RESPIRATION DUE TO CONSOLIDATION OR COLLAPSE; PLEURITIC ADHESIONS—BRONCHIECTASIS FROM EXTERNAL DILATING FORCE IN CONSOLIDATED LUNGS	209

## LECTURE XI.

*PULMONARY EMPHYSEMA.*

RELATIONS OF EMPHYSEMA WITH BRONCHITIS—VARIOUS OPINIONS AS TO THE MECHANICAL CAUSE OF EMPHYSEMA—CONSTITUTIONAL CHARACTER OF EMPHYSEMA: DISEASE OFTEN HEREDITARY: OFTEN FOUND IN SEVERAL MEMBERS OF THE SAME FAMILY; OFTEN IN CONNECTION WITH GOUT OR RHEUMATIC FEVER—DEVELOPMENT OF EMPHYSEMA USUALLY PRECEDED BY LOSS OF TONE IN PULMONARY TISSUES—SENILE EMPHYSEMA; COMPENSATORY EMPHYSEMA; CONSTITUTIONAL OR SUBSTANTIVE EMPHYSEMA; BRONCHITIC EMPHYSEMA—DEVELOPMENT OF SUBSTANTIVE EMPHYSEMA WITHOUT COUGH: INVARIABLE SUPERVENTION OF BRONCHITIS—INTIMATE CONNECTION OF THE GOUTY DYSCRASIA WITH SUBSTANTIVE EMPHYSEMA—COMPLICATION OF BRONCHITIS WITH EMPHYSEMA CAUSING TRICUSPID REGURGITATION, ALBUMINURIA, AND ANASARCA; SAFETY-VALVE FUNCTION OF TRICUSPID VALVE—SIMULTANEOUS DEVELOPMENT OF BRONCHITIS AND EMPHYSEMA—EFFECTS OF EMPHYSEMA ON THE MECHANISM OF RESPIRATION WHEN THE DIAPHRAGM IS NOT DEPRESSED	229
--	-----

## LECTURE XII.

*PULMONARY EMPHYSEMA.*

EMPHYSEMA RESULTING FROM BRONCHITIS—SUPERVENTION OF EMPHYSEMA UPON LONG-STANDING BRONCHITIS; PITUITOUS CATARRH; PAROXYSMS OF ASTHMA—PERVERSION OF THE MECHANISM OF RESPIRATION IN EMPHYSEMA WHEN THE DIAPHRAGM IS DEPRESSED—DEFORMITY OF THORAX CAUSED BY EMPHYSEMA—DYSPNOEA OF EMPHYSEMA DUE TO DIMINISHED POWER OF EXPIRATION	259
---	-----

LECTURE XIII.

*BRONCHITIS AND DISEASES OF THE HEART.*

	PAGE
RELATIONS OF BRONCHITIS WITH DISEASES OF THE HEART—BRONCHITIS A CONSEQUENCE OF DISEASE OF THE LEFT SIDE OF THE HEART; A CAUSE OF DISEASE OF THE RIGHT SIDE OF THE HEART—INCOMPETENCE OF THE MITRAL VALVE A PREDISPOSING CAUSE OF BRONCHITIS: MODE OF ACTION: PULMONARY CONGESTION—SECONDARY RESULTS; GENERAL VENOUS CONGESTION; ALBUMINURIA; ANASARCA; HÆMOPTYSIS; PULMONARY APOPLEXY—EFFECTS OF INCOMPETENCE OF THE MITRAL VALVE IN CAUSING BRONCHITIS PRIMARILY MECHANICAL—SAME EFFECTS PRODUCED BY CONSTRICTION OF THE MITRAL ORIFICE—ACTION OF MITRAL INCOMPETENCE INDIRECT: OF MITRAL CONSTRICTION DIRECT	. 280

LECTURE XIV.

*BRONCHITIS AND DISEASES OF THE RIGHT SIDE OF THE HEART.*

DISEASE OF THE RIGHT SIDE OF THE HEART A CONSEQUENCE OF BRONCHITIS AND EMPHYSEMA—HYPERTROPHY OF THE WALL OF THE RIGHT VENTRICLE—DILATATION OF THE RIGHT CAVITIES—ORIGIN OF HYPERTROPHY IN THE EFFORTS OF THE RIGHT VENTRICLE TO OVERCOME THE OBSTRUCTION TO THE PULMONARY CIRCULATION—ORIGIN OF DILATATION IN OVER-DISTENSION OF THE CAVITIES ARISING FROM THE INABILITY OF THE VENTRICLE TO DRIVE THE BLOOD FORWARD INTO THE LUNGS—RESULTS OF DILATATION OF THE RIGHT SIDE OF THE HEART: VENOUS CONGESTION AND ITS CONSEQUENCES—BRONCHITIS OFTEN SECONDARY TO OTHER DISEASES: NO CONSEQUENT CHANGE IN RELATION OF BRONCHITIS AND EMPHYSEMA TO DISEASE OF THE RIGHT SIDE OF THE HEART	. 298
---	-------

INDEX	. 319
-------	-------

SECTION I

ARTICLE I

The first section of the article discusses the powers of the legislative branch, including the authority to make laws, regulate commerce, and declare war. It also outlines the process for passing bills and the role of the President in signing or vetoing them.

SECTION II

ARTICLE II

The second section of the article details the powers and duties of the executive branch, primarily the President. It covers the President's role in appointing and removing officials, the power of pardon, and the President's responsibility to execute the laws of the United States.

CHAPTER III

SECTION I

ARTICLE I

## INDEX OF CASES.

CASE	PAGE
1. Acute Bronchial Catarrh with Fetid Expectoration . . . . .	13
2. Simple Acute Catarrh of the larger Bronchial Tubes . . . . .	33
3. Simple Acute Catarrh of the larger Bronchial Tubes . . . . .	35
4. Simple Acute Catarrh of the larger and intermediate Bronchial Tubes . . . . .	38
5. Acute Catarrh of the larger and intermediate Bronchial Tubes, with Acute Nephritis . . . . .	41
6. Acute Catarrh of the Bronchial Tubes with Typhoid Fever . . . . .	46
7. Acute Catarrh of the Capillary Bronchial Tubes . . . . .	57
8. Acute Catarrh of the Capillary Bronchial Tubes . . . . .	61
9. Acute Catarrh of the Capillary Bronchial Tubes . . . . .	63
10. Catarrh of the Capillary Bronchial Tubes engrafted on Chronic Bronchitis; Venous Congestion; Pulsation in Cervical Veins; Albuminuria; Death; Post-mortem examination; Hypertrophy of Right Ventricle; Induration of Liver and Spleen; Capillary Extravasations on Mucous Membrane of Stomach and Ileum . . . . .	68
11. Capillary Bronchitis supervening upon Chronic Bronchial Catarrh; old Phthisis; Hæmoptysis; Albuminuria; Death; Post-mortem examination; Cavities lined with Membrane in Right Lung; Fibroid condition of both Lungs; Miliary Granulations; Hypertrophy of the Heart . . . . .	71
12. Old Catarrhal Phthisis in a quiescent state; Acute Capillary Bron- chitis; Death . . . . .	74
13. Latent Phthisis; Acute Catarrh of Capillary Bronchial Tubes; Death; Post-mortem examination; Cavities lined by Membrane in Apices of both Lungs; Fibroid state of both Lungs . . . . .	76
14. Dry Catarrh of Bronchial Tubes; Paroxysms of Asthmatical Dyspnœa . . . . .	82
15. Dry Catarrh of Bronchial Tubes; Commencing Pulmonary Em- physema . . . . .	84
16. Dry Catarrh of the Bronchial Tubes; Psoriasis . . . . .	88
17. Dry Catarrh of the Bronchial Tubes; Psoriasis; Orthopnœa; Repeated Relapses from slight causes . . . . .	90
18. Dry Catarrh of the Bronchial Tubes; Severe Orthopnœa; Relapse caused by Fog . . . . .	95

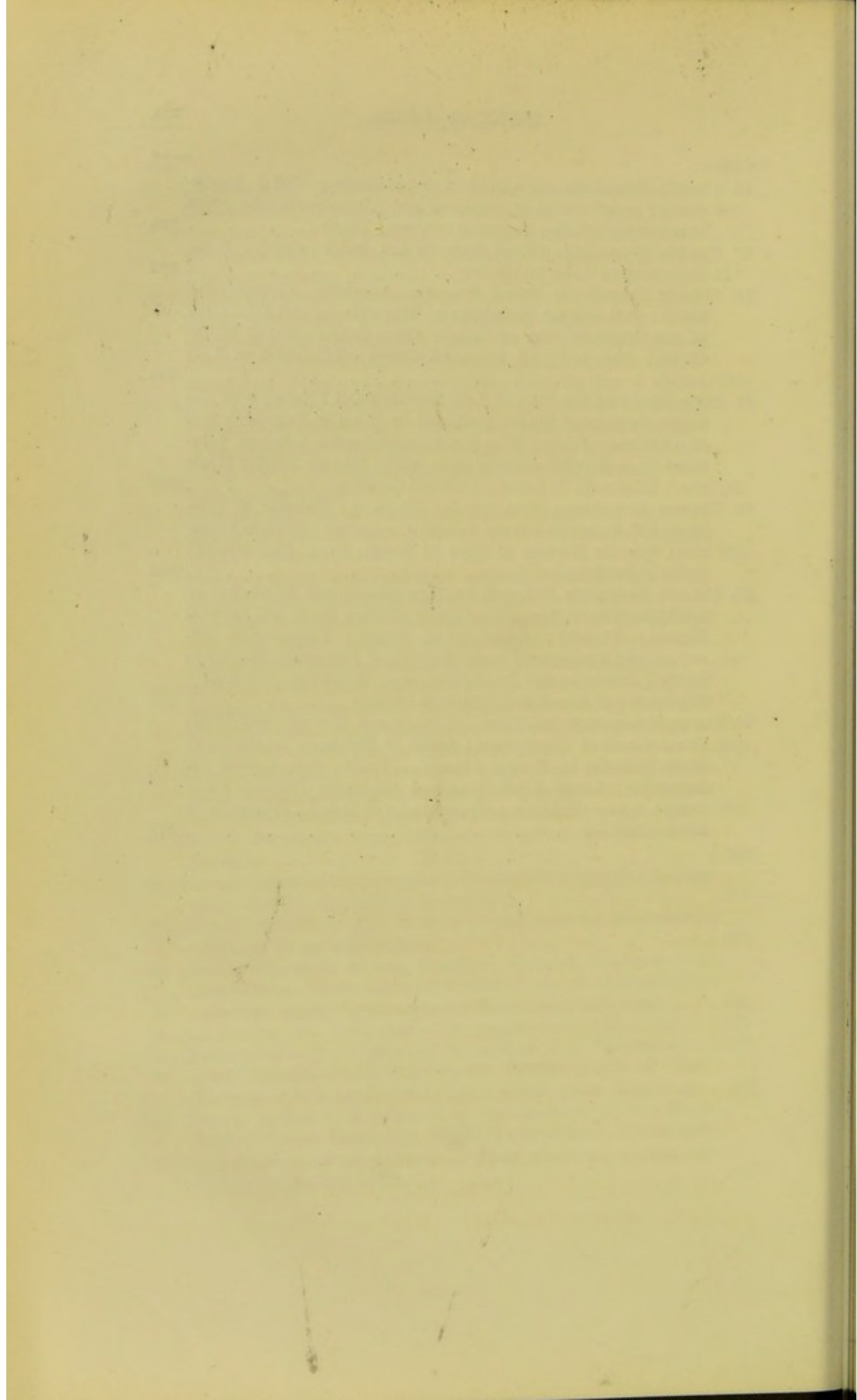
CASE	PAGE
19. Dry Catarrh of Bronchial Tubes; Commencing Emphysema; Paroxysms of Asthmatic Dyspnoea; Venous Congestion; Relapse	98
20. Chronic Catarrh of the Bronchial Tubes originating from Exposure to Cold and Wet in childhood . . . . .	106
21. Chronic Bronchitis and slight Consolidation of Lung, from Mechanical Irritation excited by the Inhalation of Grit . . . . .	109
22. Chronic Bronchitis from Mechanical Irritation excited by the Inhalation of Grit; Supervention of Pleuro-pneumonia under observation; Fragments of Lung Tissue in Sputum; Relief from temporary discontinuance of occupation . . . . .	112
23. Chronic Bronchitis excited by the Inhalation of Metallic Dust and Grit; Gradual supervention of Phthisical Symptoms under observation; Shrinking of the Walls of the Thorax; Hæmoptysis .	114
24. Chronic Bronchitis excited by the Inhalation of Dust in the process of Chaff-cutting; Immediate relief from temporary discontinuance of occupation . . . . .	119
25. Chronic Bronchitis excited by the Inhalation of Dust in the process of Wool-cleaning; Relief on discontinuance of occupation; Relapse on return to work; Complete and permanent recovery after change of employment . . . . .	120
26. Chronic Bronchitis excited by the Inhalation of Bronze Powder, in the process of Paper-staining; Rapid recovery on removal to another department of work . . . . .	122
27. Chronic Bronchitis excited by the Inhalation of Fumes evolved by the combustion of Coke and Charcoal . . . . .	124
28. Chronic Bronchitis with Asthmatic Paroxysms; History of Regular Gout or Bronchitis in several members of patient's family . . . . .	130
29. Chronic Bronchitis and Albuminuria; History of 'Rheumatic Gout' in patient, and of Regular Gout or Bronchitis in several members of patient's family . . . . .	131
30. Chronic Bronchitis following attacks of Regular Gout . . . . .	134
31. Chronic Bronchitis accompanying Regular Gout; Aggravation of Bronchitis on subsidence of Gout; Relief of Bronchitis simultaneously with return of Gout; Ultimate supersession of Gout by Bronchitis . . . . .	135
32. Chronic Bronchitis alternating with Irregular Gouty symptoms; Gouty Dyspepsia; Lepra; Lumbago . . . . .	136
33. Chronic Bronchitis alternating with Lumbago or Sciatica . . . . .	138
34. Chronic Bronchitis with long-standing Regular Gout; History of Bronchitis or Gout in several members of patient's family . . . . .	139
35. Chronic Bronchitis in a gouty subject; History of Regular Gout previous to the appearance of the Bronchial affection; Subsidence of the Bronchitis simultaneously with the development of Gout . . . . .	141
36. Chronic Bronchitis accompanied by Gout, Psoriasis, Anasarca, and Albuminuria; Repeated alternations of Gout, Bronchitis, and	

CASE	PAGE
Psoriasis; History of Psoriasis in patient's grandfather, mother, aunt, sister, and brothers . . . . .	149
37. Chronic Bronchitis attended by Emphysema and Phthisis; Gouty deposits on wrist and knuckles; Enlarged Liver; Acute Mania; Death; Post-mortem examination; Granular disease of Kidneys; Deposits of Urate of Soda in those organs . . . . .	154
38. Chronic Bronchitis and Emphysema preceded by long-standing General Eczema; Recovery from Bronchitis under treatment . . . . .	157
39. Uric-acid Gravel alternating with Psoriasis and Bronchitis . . . . .	161
40. Chronic Bronchitis and Gravel followed by Stone; Lithotripsy; Death subsequently from Bronchitis . . . . .	161
41. Calculus in Bladder; Lithotripsy; Followed successively by Lumbarago, ill-developed Gout, and Chronic Bronchitis; Death subsequently from Bronchitis . . . . .	162
42. Chronic Bronchitis and Phthisis excited by the Inhalation of Slate-dust; Death; Post-mortem examination; Consolidation and Induration of Lungs by Fibroid Growth; Irregular Ragged Cavity in Left Lung . . . . .	166
43. Chronic Bronchitis and Phthisis excited by the Inhalation of Grit; Slow course of the disease; Sudden aggravation on supervention of Catarrh; Hæmoptysis; Death; Post-mortem examination; Consolidation and Induration of Lungs by Fibroid Growth; Irregular Cavity in Lower Lobe of Left Lung; Microscopical appearances; Angular siliceous particles embedded in Lungs . . . . .	168
44. Catarrhal Phthisis; Great improvement under treatment . . . . .	174
45. Catarrhal Phthisis; Slow but complete recovery . . . . .	176
46. Measles followed by Catarrhal Pneumonia; Recovery . . . . .	178
47. Catarrhal Pneumonia supervening on Measles; Consolidation of Lung; Slow recovery . . . . .	182
48. Bronchitis; Catarrhal Pneumonia; Consolidation of Apex of Right Lung; Great improvement after Hæmoptysis . . . . .	185
49. Acute Phthisis supervening upon Catarrh; Death; Post-mortem examination; Large Cavity in Right Lung communicating with Pleural Sac; Several smaller Cavities; Caseous Deposits in Lungs . . . . .	188
50. Broncho-Pneumonia; Subsequent Chronic Bronchitis for five years; Bronchiectasis; Death; Post-mortem examination; Numerous Dilatations of Smaller Bronchial Tubes in Lower Lobe of Left Lung; Similar but less numerous Dilatations in Upper Lobe of Left and also in Right Lung; Hypertrophy and Dilatation of Right Side of Heart . . . . .	193
51. Pleurisy in Childhood; Chronic Bronchitis for several years; Recent Catarrh; Hæmoptysis; Fetid Sputum; Orthopnoea; Death; Post-mortem examination; Both Lungs firmly attached to Diaphragm; Left Lung also to Walls of Chest; Numerous Dilatations of Bronchial Tubes, especially in Upper Lobes and towards Apices of Lungs; Cavern-like Dilatations in Apex of Left Lung; Hypertrophy and Dilatation of Right Ventricle . . . . .	200

CASE	PAGE
52. Bronchiectasis; Pleurisy; Fetid Sputum; Acute intercurrent attack under observation; Great amendment . . . . .	209
53. Pneumonia seven years before; Chronic Bronchitis in winter; Bronchiectasis; Hæmoptysis; Phthisis; Fragments of Lung Tissue in Sputum; Relieved . . . . .	213
54. Chronic Bronchitis supervening on Acute; Fetid Sputum; Occasional Orthopnœa; Death; Post-mortem examination; Both Lungs adherent; Extensive Fibroid Change of Posterior part of Right Lung; Cavities lined by Bronchial Membrane in Consolidated part of Lung; Numerous Miliary Granulations . . . . .	219
55. Acute Bronchitis; Delirium Tremens; Fetid Sputum; Death; Post-mortem examination; Right Lung firmly adherent to Chest Wall; Bronchial Tubes much dilated in bases of both Lungs; Ulceration in several of the Dilatations; Gangrene of Lung around Ulcerations . . . . .	223
56. Pulmonary Emphysema developed without Bronchitis; Supervention of Bronchitis under observation; Bronchitis and Emphysema in patient's mother . . . . .	238
57. Pulmonary Emphysema developed without Bronchitis in a Gouty subject; Supervention of Bronchitis and Gout; Subsidence of the Gout and Bronchitis simultaneously with an outbreak of Psoriasis; Recovery, except as regarded the Emphysema; History of Gout in several members of the patient's family . . . . .	241
58. Extensive Emphysema developed without Bronchitis in a Gouty subject; Supervention of Bronchitis followed by Tricuspid Regurgitation; Albuminuria and Anasarca; Disappearance of these symptoms on relief of Bronchitis . . . . .	246
59. Chronic Bronchitis and extensive Emphysema superseding regular Gout; Asthmatic Paroxysms; History of Gout in patient's father; of Bronchitis in father, mother, and sister . . . . .	251
60. Chronic Bronchitis from childhood; Dyspnœa; Pulmonary Emphysema . . . . .	260
61. Chronic Bronchitis followed by Pulmonary Emphysema; Orthopnœa; Nightly Asthmatical Paroxysms. . . . .	264
62. Chronic Bronchitis followed after several years by Emphysema; 'Asthma' in patient's father . . . . .	265
63. Chronic Bronchitis of long standing; Gradual development of Emphysema; Remarkable perversion of the mechanism of Respiration, caused by depression of Heart and Diaphragm . . . . .	269
64. Emphysema with perversion of the mechanism of Respiration . . . . .	272
65. Emphysema with perversion of the mechanism of Respiration . . . . .	273
66. Chronic Bronchitis and Emphysema; Globular shape of Chest; Distress in breathing consequent on depression of Diaphragm . . . . .	273
67. Chronic Bronchitis the sequel of Incompetency of the Mitral Valve; Venous Congestion and its consequences, Albuminuria and Anasarca; Disappearance of these symptoms on the subsidence of the Bronchitis . . . . .	281

CASE	PAGE
68. Chronic Bronchitis the sequel of long-standing Mitral Insufficiency; supervention of Anasarca and Albuminuria; Recovery from the Bronchitis; Repeated relapses; Death . . . . .	290
69. Chronic Bronchitis; Mitral Stenosis and Incompetency; Great improvement under treatment . . . . .	292
70. Chronic Bronchitis; Mitral Stenosis; Anasarca; Albuminuria; Death; Post-mortem examination; Hypertrophy and Dilatation of the Right Cavities of Heart; Great Constriction of Mitral Orifice; Narrowing of Tricuspid Orifice; Dilatation of Left Auricle . . . . .	294
71. Hypertrophy of the Wall of Left Ventricle and Dilatation of the Right Cavities of Heart, produced by Chronic Bronchitis and Emphysema; Death; Post-mortem examination; Lungs Voluminous and Emphysematous, traversed by Fibrous Bands; Heart much Enlarged; Dilatation of Right Cavities . . . . .	299
72. Chronic Bronchitis; Hæmoptysis; Anasarca; Œdema of Conjunctivæ; Enlarged Liver; Venous Congestion; Jugular Pulsation; Systolic Murmur at Apex of Heart; Great improvement under observation . . . . .	305
73. Chronic Bronchitis followed by Hypertrophy and Dilatation of the Right Side of Heart; Previously existing Renal and Arterial Disease; Pleurisy; Albuminuria; Death; Post-mortem examination; Lymph on Pleura; Patches of Pulmonary Apoplexy; Lungs Voluminous and Emphysematous; Hypertrophy of Heart; Thickening of Mitral and Tricuspid Orifices . . . . .	307
74. Incompetency of Mitral Valve; Phthisis and Chronic Bronchitis; Development of Emphysema; Arrest of Phthisis; Dilatation of Right Cavities of Heart; Anasarca; Death; Post-mortem examination; Lungs Voluminous and Adherent; Obsolete Cavities in Apices of Lungs; Hypertrophy of Heart; Dilatation of all the Cavities . . . . .	313





# BRONCHITIS.

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## LECTURE I.

### NATURE AND SYMPTOMS OF BRONCHITIS.

PRELIMINARY OBSERVATIONS—RELATIONS OF BRONCHITIS WITH OTHER DISEASES—NATURE OF BRONCHITIS—CONSTITUTIONAL SYMPTOMS: FEVER SLIGHT; REMITTENT; COMPLICATION WITH GASTRIC CATARRH—LOCAL SYMPTOMS: DISTURBANCE OF RESPIRATION; DYSPNŒA; ORTHOPNŒA; COUGH; EXPECTORATION—EXPECTORATION IN ACUTE BRONCHITIS; SPUTUM CRUDUM; SPUTUM COCTUM—IN CHRONIC BRONCHITIS—IN PLASTIC BRONCHITIS—IN PITUITOUS CATARRH—FŒTID EXPECTORATION—BLOOD AND FOREIGN BODIES IN EXPECTORATION; ABSORPTION OF SOOT AND SIMILAR FOREIGN BODIES INTO LUNGS—PHYSICAL SIGNS OF BRONCHITIS; MOVEMENTS OF CHEST; PERCUSSION RESONANCE; SIBILUS; RHONCHUS; CREPITATION.

GENTLEMEN,—Bronchitis, that is to say inflammation of the mucous membrane lining the bronchial tubes, is one of the commonest of diseases. On this account alone its careful study would be very important; for, however great the scientific interest may be which attaches to the investigation of rare and obscure diseases, it will be practically more essential to the performance of the daily duties of your profession that you should be thoroughly acquainted with diseases of every-day occurrence. Moreover, in estimating the importance of the study to which I now invite your attention, we must not overlook the fact that bronchitis has peculiarly wide and intimate relations with other local

diseases and, also, with several of the most prevalent forms of constitutional disorder.

These relations, as I have pointed out to you on many occasions, especially with reference to chronic bronchitis, may be relations either of cause or of consequence. Thus, on the one hand, bronchitis may directly produce some secondary lesion of the lungs or heart, or may more indirectly give rise to disease of the liver or kidneys. On the other hand, bronchitis may itself be secondary to some other disease of the lungs or to some disease of the heart or kidneys; or, again, to some constitutional vice, such as gout or rheumatism. So intimately and constantly, indeed, is bronchitis associated with other diseases of the lungs, that, as Dr. Stokes long since wrote in his valuable work 'On the Diagnosis and Treatment of Diseases of the Chest,' the study of bronchitis furnishes us with a key to thoracic pathology; a statement which, I venture to say, is even more applicable now than it was forty years ago.

On account, therefore, of the interest and importance of the subject, I propose, in this and some subsequent lectures, to enter more systematically into the consideration of bronchitis than I have hitherto done in my clinical lectures. The wards will, from time to time, afford a sufficient variety of cases to illustrate the subject in almost all its forms and relations. My lecture to-day, and a considerable part, at least, of my next lecture will be usefully occupied by a general description of the nature, symptoms, causes, and varieties of bronchitis.

I have said that bronchitis is essentially an inflammatory affection of the bronchial mucous membrane; but Niemeyer, a very great authority, appears to consider hyperæmia of the bronchial membrane and bronchial catarrh as synonymous, on the ground that every considerable hyperæmia gives rise to a series of nutritive and functional disorders of a catarrhal

character. The fact stated by Niemeyer is unquestionable, as you have all seen in cases of pneumonia or of pleurisy, when the obstruction to the circulation through one lung has led to hyperæmia of its fellow passing into bronchitis. Strictly speaking, however, pulmonary congestion can only be viewed as a condition very strongly predisposing to bronchitis, not as bronchitis itself, which does not exist until the congestion of the vessels has caused modified nutrition of the mucous membrane, attended by inflammatory exudation; not, in short, until the hyperæmia has produced increased or otherwise modified secretion from the mucous surface.

Whatever may be its relations or its causes, bronchitis, as I have said, is always an inflammatory affection of the bronchial membrane; the same surface is always the seat of irritation, the same tissues are always the seat of the inflammatory process. It therefore, invariably, presents to our observation similar symptoms. But, although these symptoms are always of the same kind, they vary somewhat as regards character with the circumstances of each case that comes before us; such as the exact seat of the bronchitis, whether in the larger, middle-sized, or capillary tubes, the greater or less intensity of the inflammation, and the more or less acute or chronic course of the disease.

The symptoms observed in bronchitis are due to the effects of the bronchial inflammation, first upon the general constitution, and, secondly, upon the respiratory organs themselves.

The constitutional symptoms of bronchitis vary greatly according to the stage and severity of the disease and the age of the patient. Acute bronchitis, like other inflammatory diseases, is usually ushered in by chilliness and attended by fever. In chronic bronchitis, on the contrary, fever is for the most part absent, unless when an acute recrudescence occurs; indeed in this form of the disease, the temperature

is most commonly below the normal standard; and in many cases, beyond this abnormal depression of the temperature, there is little or no constitutional derangement, though in other cases there is more or less anæmia, feebleness, and emaciation.

Even in the most acute forms of uncomplicated bronchitis the febrile disturbance is, for the most part, comparatively slight and of short duration, and bears no constant relation to the importance of the local disease. It is of remittent type, being characterised by morning remissions and evening exacerbations, and subsides gradually and not suddenly as occurs in pneumonia. In adults the temperature in acute bronchitis usually ranges from  $99\cdot0^{\circ}$  to  $102\cdot6^{\circ}$ , rarely rising above the latter point, and usually falling to the normal standard in the course of two or three days. The pulse also is seldom very frequent, excepting in children, ranging as a rule from 80 to 100. In the bronchitis of young children both the pulse and temperature are often much higher than in adults, the pulse especially being often extremely frequent. At the outset of acute bronchitis, the pulse is rather full, usually in the course of a few hours becoming soft and compressible. The skin, at first perhaps dry, soon becomes moist, and even profuse perspiration may supervene in a day or two. The urine is scanty and high coloured, and commonly at an early period of the illness throws down a copious precipitate of urates. As in other febrile diseases, the acute stage of bronchitis is accompanied by thirst, a white tongue, and loss of appetite. Sometimes the gastric mucous membrane is affected by the catarrh, simultaneously with the bronchial membrane, and in such cases epigastric uneasiness, nausea, and even vomiting may be prominent and early symptoms. This applies, however, more especially, though by no means exclusively, to cases of epidemic catarrh pervading almost the whole population,

which are to be regarded rather as catarrhal fevers, of which bronchitis is one of the principal features, than as ordinary cases of bronchitis. In acute bronchitis the prostration is often out of proportion to the real urgency and severity of the local disease; this, again, applies more particularly to cases of influenza or epidemic catarrh, which is remarkable for the amount of prostration and debility that attend it.

Acute bronchitis, in healthy persons, usually begins with a feeling of rawness and roughness in the throat, which on inspection is seen to be inflamed. Sometimes also it commences with catarrh of the nasal passages. There is almost invariably either headache or a sense of weight in the forehead. A feeling of *malaise* and weariness, aching of the limbs, pain in the loins and very commonly quasi-rheumatic pains of the muscles, accompany the accession of the febrile symptoms. Soreness and tightness of the chest, especially of the upper sternal region, supervene soon after the outset of the catarrh. The pain in this situation is so much aggravated by the frequent cough that patients describe it as a sensation of the membrane being torn asunder. After a day or two, severe pain of the abdominal muscles, especially in the vicinity of the costal arch, is usually complained of. This is unquestionably the consequence of the strain and over-exertion of these muscles in the frequently-repeated act of coughing.

The manifestations of bronchitis immediately referable to the lungs are more or less disturbance of the respiration, cough, and expectoration; and these are attended by important changes in the signs afforded by physical examination of the thorax. The respiration is usually accelerated in acute bronchitis; in severe cases the respirations may be as frequent as 40 or 50, and in children even as high as 60 in a minute. In chronic bronchitis the frequency of the respiration is sometimes greater, at other times less, than the

standard of health. Both in acute and chronic bronchitis there is frequently dyspnoea and sometimes orthopnoea. The amount of dyspnoea varies much in the same patient at different times; whilst the patient keeps quiet the respiration may be merely quickened, but, on exertion, and especially on coughing, the difficulty of breathing may be very great. In another class of cases, again, the patient's breathing is constantly difficult, the accessory muscles of respiration being brought into play even when the patient is still. Again, orthopnoea may supervene from time to time, in the form of asthmatic paroxysms, or it may be so constant as to prevent the patient from lying down for several days together. The presence or absence of dyspnoea and orthopnoea depend chiefly upon the part and extent of the bronchial membrane which is affected, and also, probably, upon the presence or absence of spasm in the bronchial tubes. When the inflammation is confined to the larger tubes, there being no impediment to the free admission of air to the bronchioles and air-cells, dyspnoea is absent or inconsiderable; but, in proportion as the inflammation extends into the smaller twigs of the bronchial tree, the obstruction to the flow of air through tubes narrowed by reason of the swelling of their inflamed mucous membrane, impedes the process of respiration, and causes more or less dyspnoea according as the smaller ramifications of the tubes are more or less extensively implicated in the catarrhal process. In short, the dyspnoea in bronchitis depends chiefly upon the degree in which the passage of air to and from the air-cells is impeded.

Cough almost invariably attends bronchitis, and is often a very distressing symptom. In uncomplicated bronchitis it is rarely absent, or even slight enough to escape the observation either of the patient or his attendants. In the early stage of acute bronchitis, affecting chiefly the larger tubes, the cough is short, dry, and more or less frequent according

to the degree of irritation of the bronchial mucous membrane and, perhaps, the idiosyncrasy of the individual patient. The irritation which excites the cough is generally referred to a sense of uneasiness or tickling in the throat or trachea, and may often be mitigated by an endeavour to restrain coughing or by some simple demulcent. In proportion as the catarrh extends into the smaller tubes, the cough becomes more violent and more paroxysmal. It also varies greatly according to the amount of secretion from the inflamed membrane. In that form of bronchitis to which Laennec gave the name of dry catarrh, namely that in which there is much hyperæmia and swelling of the mucous membrane, with only scanty secretion, the cough is very distressing and abortive. It is likewise very troublesome and frequent when the inflammation is situated mainly in the smaller tubes and bronchioles, which have little muscular power to assist in the process of expectoration.

At the commencement of bronchitis the cough is either altogether unattended by expectoration, or the sputum consists only of a scanty, saltish-tasted, watery froth. As the disease advances, the secretion from the inflamed membrane becomes more copious, and, in ordinary cases, the cough becomes correspondingly easier as the sputum becomes more opaque and copious and pervaded by the cell-elements thrown off in abundance from the inflamed surface. This relief arises partly from the subsidence of the irritation, which is coincident with the increased secretion from the inflamed membrane, and from the diminution of the hyperæmia which ensues; and also, partly, from the secretion itself becoming looser and less tenacious as the inflammation subsides. So long as the mucus continues ropy, transparent, and tenacious, so long it is difficult to raise, and so long does the cough remain abortive and troublesome. Hence, in dry catarrh, in which the expectoration is very scanty and usually very



tenacious, the cough often remains for many days abortive, paroxysmal, and very distressing to the patient.

The expectoration varies much in character in different stages and forms of bronchitis. Its various appearances, therefore, afford valuable aid, both in diagnosis and prognosis; for they enable us to determine the nature and stage of the illness, and assist us materially in estimating, from day to day, the progress of the patient towards recovery. Dr. Stokes, of Dublin, was the first among British authors who accurately methodised the study of the sputum in bronchitis. Nearly forty years have elapsed since the publication of his work 'On the Diagnosis and Treatment of Diseases of the Chest,' and several other authors, especially amongst the Germans, have, during that period, written ably and well on the same subject; but, due allowance being made for the advance in medical science and, especially, in the study of the secretions and of the local phenomena of inflammation, very little of moment has been added to Dr. Stokes's description.

In the early stage of acute bronchitis, expectoration is either entirely absent, or it consists of a scanty watery mucus raised in the form of froth, but becoming liquid as the air escapes with which it is intimately imbued at the moment of expulsion. After a day or two, the sputum, though still remaining transparent and colourless, becomes more glairy, and may even acquire an almost gelatinous, or colloidal appearance, and become so tenacious as to adhere to the bottom of the vessel in which it is contained, without being displaced even when the vessel is inverted. The greater or less tenacity of the sputum may be regarded as an indication of the greater or less intensity of the irritation. Very glutinous and transparent sputum is usually expelled in small masses, which coalesce in the basin and may generally, I think, be considered as diagnostic of inflammation of the

smaller tubes or of the bronchioles. As may be inferred from what I have said, the very glutinous sputum contains little air; but less tenacious sputum, whilst still transparent and crude, is more or less churned up with air in the act of coughing, and becomes more or less frothy in proportion to the severity of the coughing fit by which it is expelled. Sometimes, instead of being transparent and colourless, the crude sputum of acute bronchitis is of a greyish-white, pearl colour, and only semi-transparent. Such sputum is indicative either of decreasing intensity of the disease, or of an originally milder degree of bronchial inflammation.

As time advances, coincidently with the subsidence of the bronchial irritation the expectoration becomes opaque and acquires a greenish or yellowish hue. In many cases, however, the disease does not run regularly and uninterruptedly through these several stages. Recrudescences, or perhaps rather relapses, are apt to occur from slight causes; and, whether in the later stages of acute bronchitis, or in chronic bronchitis, these relapses are accompanied by corresponding changes in the expectoration, which will at once resume its former character, or consist partly of frothy transparent fluid, and partly of opaque greenish or yellowish-white coloured mucus. If, on the one hand, this return of the sputum to a crude form helps us to diagnose an acute relapse, so it follows, on the other hand, that the appearance of masses or streaks of yellow or opaque sputum in the midst of the frothy sputum of a recent bronchitis, enables us to determine that the present acute bronchitis has been engrafted upon an old standing catarrh of the bronchial membrane.

In the earlier stages of bronchitis the sputum, whilst still transparent or semi-transparent, consists principally of mucus, and, under the microscope, is seen to contain only mucus corpuscles and epithelium, partly derived from the

mouth and throat and partly from the air passages. As yet, the excessive growth of new cells, which results from the inflammation, has not advanced far enough to admit of their being shed; as yet, the inflammation has not attained its crisis and begun to subside. At a later stage of the disease, when the sputum has lost its transparency and become opaque, it is found to abound in cells which have been thrown off from the inflamed membrane, intermixed with epithelium and granular matter. It still, however, probably coalesces in the basin and has not altogether lost its viscosity. This kind of sputum, in contradistinction to the transparent or crude sputum, was called *sputum coctum* by the older physicians: a term which modern observation shows to have been most appropriate. Occasionally, when the sputum has been allowed to collect for several hours in the spitting-basin, it is seen to be variously mixed: some portions consisting of crude, transparent, and glutinous mucus, whilst other portions are more concocted, opaque, and less viscid. This indicates that the disease is not equally advanced in every part of the bronchial tubes; that whilst, in some situations, the inflammation has entered upon a later stage, in others it is in an earlier and more acute stage. If the sputum be now examined under the microscope, it will be seen to be in different stages of development; some portions consisting of transparent mucus, others being granular, and others, again, having undergone fatty metamorphosis.

If the inflammation should pass into a chronic state, or the acute attack should have been engrafted upon an old bronchial catarrh, the sputum becomes more decidedly mucopurulent, or even puriform, and presents under the microscope a large proportion of pus globules intermixed with granular and fatty cells, epithelium, and granular *débris*. Mucopurulent and puriform sputum may be small in quantity and of a bright yellow colour, and may coalesce and

form a semi-fluid slightly adhesive mass. This is more particularly observed in patients who have long suffered from chronic bronchitis, at times when they are in their best state, and is, I think, most frequent when dilatation of the bronchial tubes exists; at any rate, it indicates an extensive and chronic catarrh of the larger bronchial tubes. Much more commonly the sputum in chronic bronchitis is copious, and consists of opaque masses, of whitish or yellowish-white colour, suspended in a more or less abundant frothy fluid. After standing for some time these masses may coalesce, leaving a supernatant frothy fluid; or they may remain separate, and present a nummular appearance somewhat resembling the sputum raised from phthisical cavities. On careful examination of the sputum in chronic bronchitis, you will often observe small white concretions or long filamentous-looking pieces resembling particles of rice or vermicelli; or you may find a few opaque casts of the bronchial tubes. Sometimes these casts are branched, corresponding to the subdivisions of the tubes in which they have been moulded.

In one very rare form of chronic bronchitis, these casts form a more considerable part of the sputum, and the disease derives from them its name of plastic bronchitis. The casts are, in such cases, frequently of considerable size and subdivided into several branches; they are also often expectorated at intervals over periods of many years' duration. The casts are usually enveloped in a tenacious mucus streaked with blood, and sometimes their expulsion is preceded or followed by more copious hæmorrhage. This form of bronchitis is not incompatible with good habitual health, though urgent dyspnœa and distressing cough usually co-exist with the paroxysms. I may add that I have not seen any serious consequences arise from simple plastic bronchitis. One such case, that of a lady aged about thirty-five years, is now under my observation. She has been suffering from this form of

bronchitis for nearly twenty years without its having as yet led to any more serious result than a valetudinarian state of health, due to the occasional attacks of dyspnoea and cough which precede and accompany the expulsion of the bronchial casts.

Again, there is a kind of sputum very loose and watery in consistence and very copious in quantity; it is called by Dr. Stokes serous secretion, and gave the name 'pituitous catarrh' to one of Laennec's varieties of bronchitis. It is colourless, and resembles thin gum water or white of egg intimately mixed with water; it is ropy and usually frothy upon the surface, and very closely resembles the scanty watery secretion of the earlier stage of bronchitis, and, also, the more abundant watery fluid in which the masses of muco-purulent sputum float in certain varieties of chronic bronchitis. Very commonly, indeed, a few flakes of opaque sputum, or of more consistent mucus, may be seen floating in the liquid which constitutes the great bulk of the sputum in these cases. Sometimes the sputum is so abundant that a large spitting basin will be filled with it twice, or even oftener, in the day. The term bronchorrhœa is applied to such cases, which are generally very chronic, and are usually, if not always, associated with some obstruction to the pulmonary circulation, arising either from vesicular emphysema or from valvular disease of the heart.

In some cases of bronchitis the sputum has a gangrenous odour, tainting the atmosphere of the apartment in which the patient lies. I believe that cases of this kind are sometimes mistaken for cases of gangrene of the lungs, from which, however, they may be distinguished by their clinical history, by the slighter constitutional disturbance which attends them, and by the physical signs. One of the most remarkable cases of this kind which I have seen was in Northumberland Ward under my care several years ago.

CASE 1.—Sarah J., a well nourished young woman of healthy aspect, aged twenty-seven years, was admitted on December 29, 1871. Her family history betrayed no tendency to any form of constitutional disease, and the patient herself had enjoyed uninterrupted good health until a fortnight before her admission into the hospital. She had then caught cold, which began in the throat, and was attended by chilliness and aching of the limbs.

On admission she complained of cough and shortness of breath. Her tongue was clean; bowels and catamenia regular and normal; pulse 100; temperature  $99.2^{\circ}$ ; urine normal. The fauces were slightly injected, and the breath was very offensive; the thorax was quite resonant, both in front and behind; the breathing was harsh and exaggerated below both clavicles; sibilus and rhonchus, intermixed with moist sub-crepitation, were audible with both acts of respiration on the left side, with inspiration only on the right; the heart-sounds and impulse were normal; the sputum was scanty, tenacious, opaque, and so intensely foetid that it polluted the air of the ward and seriously annoyed the other patients.

At first she was ordered to take, every four hours, a draught containing 15 minims of antimonial wine, 2 drachms of solution of acetate of ammonia,  $\frac{1}{2}$  a drachm of syrup of tolu, and 9 drachms of camphor water, and was placed on milk diet. On January 2, her breathing and cough having become much easier, her skin being moist and the pulse very compressible, 10 minims of tincture of squill were substituted for the antimonial wine in the draught. Her breath was now much less offensive, but the sputum continued very foetid.

On January 7 the pulse and temperature were normal, the dyspnoea had ceased, and the only abnormal sounds heard on auscultation were, here and there, some sibilus and rhonchus, and a few large dry crackles in the posterior bases of

the lungs. The sputum, which was muco-purulent and small in quantity, continued offensive.

From this time her recovery was rapid, and she was discharged at the beginning of February quite free from complaint. The sputum had ceased to be offensive before it altogether left, and the respiration and physical signs were all quite healthy.

In this case, you will observe that, there was no question either of gangrene of the lungs or of decomposition of the sputum before expulsion; for the attack was a primary one, and the patient was admitted into the hospital at an early stage of her illness.

The sputum in bronchitis sometimes contains other matters besides the products of the inflamed membrane. In its course through the fauces and mouth it becomes mixed with products from the throat, posterior nares, and mouth: a fact so obvious as to need no comment. It also occasionally contains blood. This last occurs both in acute and chronic bronchitis, and it is seen sometimes in the form of fine streaks or specks in the sputum, sometimes in greater quantity. At other times it is more intimately mixed with the sputum so as to give it a general red colour. On close examination this colour is found to be due to the admixture of the secretion with unchanged blood which has been churned up in the bronchial tubes with the sputum. Both in colour and appearance this sputum offers a striking contrast to the red or rusty sputum of pneumonia, being frothy and well-aerated instead of being viscid and slightly aerated as is the case in pneumonia. Furthermore, in these cases all the sputum is not equally tinged with blood, for whilst the greater part may be quite free from, or at most only faintly tinged with it, a few masses may sometimes be seen in the same vessel which present a much deeper discoloration. In some of these cases the bronchitis is associated with disease

of the heart, and the obstruction of the pulmonary circulation consequent on the cardiac disease is the cause of the hæmorrhage; but blood is also not infrequently seen in the sputum of bronchitic patients whose hearts are quite healthy. I have already adverted to the fact that the expulsion of casts of the bronchial tubes in plastic bronchitis is usually attended or followed by hæmoptysis; blood is also frequently seen in the sputum of patients who are suffering from Laennec's dry catarrh; and, whenever there is extensive emphysema of the lungs, the sputum is liable, from time to time, to be streaked with blood, though in small quantities and only after severe fits of coughing. The presence of blood in the sputum of patients suffering from bronchitis whose hearts are healthy, ought always to induce you to make a very careful examination of your patient; because it may be that the more obvious bronchitis is associated with phthisis. At one time, indeed, it was currently received that the presence of blood in the sputum of patients who were not suffering from cardiac disease, was an almost certain proof of the existence of tubercles in the lungs. As I have said, its presence should always be regarded with anxiety until we have satisfied ourselves that there are no grounds for suspicion; but, unless other evidence of tubercular disease be discovered, it would be rash and unjustifiable to found a diagnosis of its presence solely upon the occurrence of hæmoptysis. I have seen blood in the sputum in bronchitis in many cases in which the subsequent history of the patient has satisfactorily negatived the existence of phthisis.

Foreign bodies, inhaled from without, are sometimes seen in the sputum. This is well exemplified in a London fog, when the sputum, of all the bronchitic patients in the hospital, will often be found more or less tinged with the soot inhaled into the lungs. Soot and other colouring matters thus received into the lungs by inhalation are not always, however,



entirely expelled with the expectoration. They sometimes penetrate into the pulmonary tissue, and may possibly remain there for an indefinite period of time without causing serious disturbance of health. On the other hand, I shall have to explain, on a future occasion, that the inhalation of dust, or of heavy and angular particles, into the lungs is a frequent cause of bronchitis in operatives of many classes, and leads eventually to changes in the pulmonary structure which constitute the forms of phthisis known as 'Grinder's Rot,' 'Miner's Asthma,' 'Potter's Asthma,' 'Cotton Phthisis,' &c.

The inhalation of soot is unquestionably the main, if not the sole cause of the dark colour of the lungs so often seen in examining the bodies of persons in advanced life. At one time it was supposed that the carbon by which the lungs are pigmented in such cases was at least partly, if not exclusively, deposited from within the body, but some experiments of Knauff have satisfactorily demonstrated that the colour is really due to the soot inhaled during respiration. I should add that an opinion to this effect was long since expressed by Dr. Pearson, in a very remarkable paper published in the *Philosophical Transactions*. The conclusion deduced from Knauff's experiments is further confirmed by the fact, that Professor Zenker has found the lungs coloured red in a person who had worked for several years in an atmosphere charged with oxide of iron, in the form of an impalpable powder. The dust was diffused through the atmosphere of a small workshop during the process of preparing the small books in which gold leaf is kept for sale. You may see in our hospital museum a specimen of these red-coloured lungs, sent me by Professor Heller of Erlangen. The colouring matter thus deposited in the lungs may, as I have said, remain there embedded permanently, but sometimes, during a catarrh, it is seen in the sputum long after its absorption. Thus we occasionally see patients suffering from bronchitis whose sputum is deeply pigmented

with soot, at times when they have not recently been exposed to its inhalation, and we must, therefore, suppose that it has been derived from a deposit previously existing in the lungs. This supposition derives support from a fact once mentioned to me by a very observant medical practitioner, resident in a remote lead-mining district, where little if any soot existed in the atmosphere; namely, that miners who had been compelled to discontinue working in the vitiated atmosphere of mines on account of suffering from 'miners' asthma,' would occasionally, on being attacked with catarrh long afterwards, begin again to raise sputum tinged with carbonaceous matter.

The altered condition of the bronchial membrane, when in a state of inflammation, and the inflammatory products poured into the bronchial tubes, materially modify the signs detected by a physical examination of the thorax, and give rise to new or adventitious signs which do not present themselves in healthy lungs. Speaking, at present, only of bronchitis uncomplicated with vesicular emphysema, or any other kind of pulmonary disease, the movements of the two sides of the thorax are usually symmetrical. In bronchitis affecting chiefly the larger tubes, and unattended by dyspnoea, the movements of the chest in respiration are normal; but, when the smaller tubes are implicated and there is much dyspnoea, the expansion of the chest is sometimes observed to be deficient, although the inspiratory efforts are very laboured and the accessory muscles of respiration are brought into almost spasmodic action. Sometimes, also, there is bulging of the lower part of the sides of the chest together with diminished expansion; and, if in such cases the heart be examined, we may possibly find the area of cardiac dulness diminished and even some displacement of the apex of the heart towards the sternum. And yet all these may be only temporary results of the bronchitis, arising from distension

of the air-cells, a sort of pseudo-emphysema, consequent on impeded expiration, and may entirely disappear when it subsides. The powerful efforts at inspiration suffice, in such cases, to carry the air with comparative freedom into the bronchioles and air-cells; but during the more passive act of expiration, the return of air being obstructed by the narrowing of the bronchial tubes, the air-cells retain an excessive quantity of residual air, and becoming distended render the portion of lung in which they are situated over-voluminous. The result of these conditions is, first, that the already over-distended air-cells being incapable of receiving the accustomed quantity of air during inspiration, the lung expands less than usual, and the expansion of the chest walls is proportionally diminished. Secondly, that the over-voluminous lungs, occupying a larger space than the normal lungs, distend the sides of the thorax, and the left lung more or less overlaps and displaces the heart. This may occur in persons who are as yet quite free from vesicular emphysema, and, the natural elasticity of the lungs being unimpaired, the excess of residual air may be expelled as soon as the obstruction ceases, and the consequences I have just described may entirely disappear.

In uncomplicated bronchitis the percussion note is not sensibly impaired; but, although there is no dulness, properly so called, the sound yielded on percussion varies somewhat from that of the healthy lung, and may easily lead to a wrong inference as to its import, unless the examination be carefully conducted. Whenever the lungs are more than naturally inflated with air, an abnormal clearness of note will be elicited on percussion; and, when this condition exists, as it occasionally does, only over one lung, it may lead to the belief that there is impaired resonance in the corresponding part of the other lung. Such distension sometimes takes place in the apices of the lungs and unequally on the two

sides. If this condition be associated with prolonged expiration on the least distended side, an inexperienced examiner is very likely to diagnose consolidation of the lung upon that side which is, in truth, the least diseased. Moreover, in these cases, a sound, very closely resembling the cracked-pot sound, heard over large, empty, anfractuous lung cavities, is sometimes produced on percussion, which may still more add to the difficulty of the diagnosis. Many of you will remember a patient some time since lying in bed No. 1, Founder Ward, in whom a sound of this kind was elicited on percussion over the upper part of one side of the chest, and in that patient, the apparently impaired resonance was situated on the side opposite to that on which the cracked-pot sound was elicited. This sound, when present in bronchitis, is not very constant; it usually varies much from day to day, and is often of very short duration. It is also distinguished from the true cracked-pot sound by certain definite characters. Dr. Stokes, who first, I believe, drew attention to the occasional occurrence of this sound in bronchitis, says that it is more diffused than true cracked-pot sound; a statement which is borne out by my own experience. This wider extension of the area over which the sound is elicited, together with its less definite margin, its existence, at least frequently, on the side opposite to the apparent dulness, and its brief period of duration, suffice to distinguish it from the cracked-pot sound heard on percussion over phthisical cavities.

In bronchitis limited to the larger tubes, there being no obstruction to the ingress or egress of air, auscultation may discover no change in the sounds of respiration; but, when the disease extends to tubes of a smaller size, the breath-sounds become materially modified by the altered condition of the tubes, whilst at the same time the presence of inflammatory products within the tubes give rise to certain ab-

normal or adventitious sounds. In the early stage of bronchitis, when as yet there is no expectoration, the swollen and probably dry state of the mucous membrane gives rise to slight harshness or exaggeration of the respiratory murmur. This is observed with both the respiratory sounds, but is most obvious with the expiration, probably because in the healthy condition expiration is either inaudible, or only faintly heard, over the vesicular portion of the lungs. At a later stage, when the mucous membrane has become more swollen, or the calibre of the tubes is diminished by the presence of mucus adherent to their inner surface, the character of the respiratory sounds becomes further modified. Just as the sounds, produced by the passage of currents of air through the reeds or pipes of a wind instrument vary in tone and pitch according to the size of the tubes in which they are formed, so the abnormal sounds heard in bronchitis vary with the calibre of the affected tubes. If the sounds be formed in the smaller or much narrowed tubes they are high-pitched and have a hissing character. The term *sibilus* is applied to these high-pitched sounds, and they are more or less acute and high-pitched according to the greater or smaller calibre of the tubes in which they are formed. *Sibilus* most commonly accompanies or supersedes the sound of inspiration, but it is also frequently audible with the sound of expiration. It sometimes lasts for many hours unchanged in the same situation, at other times it is of short duration in any special site, and may even vary its position from minute to minute; though, in cases in which it occurs, it is perhaps never quite absent from some part of the lungs. It is produced by any cause which lessens the calibre of the bronchial tubes in which it is formed, and may possibly, as Laennec supposed, be sometimes altogether due to narrowing of the tubes themselves; but it is certainly often, also, due to the presence of tenacious mucus, for it will sometimes disappear entirely for a time, from

a situation where it was previously heard, after mucus has been dislodged by a fit of coughing. When sibilus depends upon narrowing of the calibre of the tubes, this may probably be altogether the result of swelling of the mucous membrane, for in cases of dry catarrh, I have frequently heard sibilus in the same situation for several successive days; but it may also undoubtedly be caused, at least in part, by spasm of the tubes, for it will in many cases be greatly abated for a time after the patient has inhaled ether or taken a sedative. Sibilus is called a dry sound, because, even when caused by tenacious mucus adhering to the mucous membrane, it does not convey to the ear any impression of the presence of fluid or moist secretion. When widely heard over the chest, or over one lung, it enables us to diagnose, with much certainty, the existence of inflammation of the smaller bronchial tubes.

When dry sounds are formed in the larger tubes they are grave and low-pitched, but vary in tone and character with the size of the tubes in which they are formed, and the condition of their contents. The name Rhonchus is applied to these graver sounds. Rhonchus is sometimes simply loud and sonorous, at other times it is, in strict accordance with its name, snoring. Rhonchus is for the most part heard with expiration, but it is occasionally audible with both the acts of respiration. It is in general either obliterated or displaced for a time by the act of coughing, and would therefore seem to be, for the most part if not always, produced by the passage of air over plugs of thick tenacious mucus adherent to the inner surface of the bronchial tubes. Its varying character unquestionably depends upon the character, form, and situation of the mucus over which the current of air passes, during its course to and from the lungs. The vibrations which give rise to rhonchus are often so pronounced that they are conveyed to the walls of the chest, and

may be perceived by the hand applied over its surface. Although rhonchus is probably always produced by the passage of air over tenacious mucus, it, like sibilus, is called a dry sound, and for the same reason. Both sibilus and rhonchus are chiefly heard whilst the sputum is still viscid; and, when both the larger and smaller ramifications of the bronchial tubes are the seat of inflammation, these sounds may be heard in association with each other in the same lung.

In most cases of bronchitis the sputum, as I have already explained, becomes, at a later period, more copious and liquid and less viscid; in these circumstances it does not adhere closely to the walls, but is more or less movable in the cavity of the tubes. The air, in its course towards the bronchioles and air-cells, no longer passes over the secretion, giving rise to the vibrations which produce sibilus and rhonchus, but displaces it and penetrates through it, causing the formation of bubbles, which in breaking create a crackling noise called crepitation. The sounds thus produced are called moist sounds. They vary in character with the size of the tubes in which they are formed, and the amount and greater or less viscosity of the fluid through which the air passes; thus we have large and small crepitation. In capillary bronchitis the crepitation is sometimes so small as somewhat to resemble the fine crepitation of pneumonia, from which, however, it differs in conveying to the ear the distinct impression of moisture, and also in being usually audible with both the sounds of respiration; whereas the fine crepitation of pneumonia is dry, and is only heard with inspiration.

When the mucus lying in the tubes is still somewhat thick and viscid, the crepitation sounds are fewer in number with each act of inspiration, longer and drier in character, and, in some instances, so closely resemble creaking, that it

is not always easy to distinguish them from pleuritic friction sounds. Crepitation, though usually heard with both acts of respiration, is sometimes only audible with inspiration, and like the other adventitious sounds of bronchitis, it may sometimes be temporarily arrested, or changed in character, by the act of coughing.



## LECTURE II.

## CAUSES AND VARIETIES OF BRONCHITIS.

CAUSES OF BRONCHITIS—PREDISPOSING CAUSES: AGE; HEREDITARY TENDENCY; FEEBLENESS OF CONSTITUTION; PREVIOUS ATTACKS; OTHER ORGANIC DISEASES; CERTAIN CONSTITUTIONAL DISEASES—EXCITING CAUSES: DIRECT; MECHANICAL OR CHEMICAL IRRITANTS; COLD AND DAMP OR HOT AND OVER-DRY AIR; INDIRECT; COLD TO SURFACE OF BODY—BRONCHITIS IN SPECIFIC FEVERS—FORMS OF BRONCHITIS; SIMPLE ACUTE BRONCHITIS; CAPILLARY BRONCHITIS; CHRONIC BRONCHITIS—ACUTE BRONCHITIS OF THE LARGER TUBES; SYMPTOMS AND COURSE—BRONCHITIS IN ACUTE NEPHRITIS—BRONCHITIS IN TYPHOID FEVER—TREATMENT OF ACUTE BRONCHITIS; CURATIVE; PROPHYLACTIC.

GENTLEMEN,—In my last lecture I gave you a general outline of the nature and symptoms of bronchitis. I explained that its nature is always the same, namely, inflammation of the bronchial mucous membrane, and that its symptoms, however variable in intensity, are always of the same character, inasmuch as it is always the same structure which is the seat of inflammation. This inflammation may, however, be produced by very various causes; some proceeding from without, others from within, the organism; some constitutional, others accidental. I therefore proceed to-day to consider the causes of bronchitis; and, as bearing upon this part of my subject, I must remind you that the liability to suffer from bronchitis varies greatly in different persons. Whilst some persons are so susceptible to bronchial irritation that every slight exposure suffices to excite an attack of bronchitis, others are so robust as to be almost insusceptible to its usual exciting causes. It is impossible, therefore, to

avoid the conclusion, that the former class of persons have a predisposition for bronchitis from which the latter class are exempt. Hence the causes of bronchitis may be considered as of two kinds; namely, predisposing causes, and exciting causes. The predisposing cause, in each case, is some condition peculiar to the individual patient; which, existing previous to the occurrence of the exciting cause, renders him more liable than other persons to be affected by it. The exciting cause is some circumstance, usually external to the individual, which shortly precedes, and appears to produce, the attack of bronchitis.

But although in most cases of bronchitis, we are able to discriminate predisposing from exciting causes, it sometimes happens, on the one hand, that an unusually intense exciting cause suffices to produce an attack of bronchitis in persons who have no special predisposition for it. Thus irritants applied directly to the bronchial mucous membrane, or extreme chilling of the surface of the body, may either of them, when they are sufficiently long in operation, produce an attack of bronchitis even in the most robust persons. On the other hand, it also sometimes happens that bronchitis is gradually developed under the prolonged influence of a predisposing cause, without the supervention of any obvious exciting cause. This, however, only occurs when bronchitis is secondary either to some constitutional disorder or to some other local disease. When bronchitis is thus developed without the intervention of any special exciting cause, it commonly begins in a subacute form and runs a chronic course. When, on the contrary, an exciting cause is strong enough to produce bronchitis in an individual who is not predisposed to it, the disease usually commences in an acute form.

The predisposing causes of bronchitis may be arranged under the following heads, viz. :—

- I. Age.
- II. Hereditary tendency.
- III. Feebleness of constitution, whether original or acquired.
- IV. Previous attacks of bronchitis.
- V. Previous organic disease, either of the lungs or other organs.
- VI. Certain constitutional diseases.

I. The periods of infancy and old age unquestionably involve a predisposition for bronchitis. Children of tender years are more sensitive to atmospheric changes and more liable to bronchial affections than older persons. Their delicate organisation has not yet acquired the vigour necessary to enable them to resist external influences, and therefore even a slight exciting cause may suffice to produce bronchitis in early life. As the child advances towards maturity, every year lessens this susceptibility, and, unless from the existence of some strong constitutional predisposition, or from exposure to some very powerful exciting cause, adults up to the close of middle age are but little liable to bronchial disease. At a later stage of life, when the degenerative changes of tissue incident to senile decay have made some progress, age again becomes a strong predisposing cause of bronchitis. These senile changes take place in different persons at very different periods of life, and old age is to be measured in such cases not by the number of years that a man has lived, but by the condition of his tissues. As an illustration of this fact, I may direct your attention to a man at present occupying bed No. 10 in Founder Ward, who, though only sixty-two years of age, is older in appearance and in tissues than many men ten or fifteen years his senior. He is a man who has had good health and been of temperate habits, and yet he is very truly suffering from premature old

age. I may here also observe that not only is bronchitis from external exciting causes more frequent, but it is also more serious and more apt to prove fatal, in childhood and old age, than during the meridian of life.

II. Hereditary tendency constitutes undoubtedly a strong predisposition for bronchitis. Such predisposition is indeed only another instance of the hereditary transmission of bodily and mental peculiarities which we see, more or less, take place in all families and sometimes in the same family through several generations. Such hereditary transmission of family peculiarities is more strikingly, but not more really exemplified in cases where the peculiarity that descends is an external deformity such as club-foot, spina bifida, or the like. As regards bronchitis, it often happens that when we investigate the family history of a patient, we learn either that parents or other near blood relations have also suffered from the same disease, and this when no other hereditary tendency to disease can be discovered. On the other hand, we find, in very many cases, that the hereditary tendency to bronchitis is associated with a hereditary predisposition to some other disease, such as gout or rheumatism. Of this I shall have occasion to speak shortly, but I may say now that, when bronchitis occurs in such circumstances, it must be regarded in the light of being only a different manifestation of the same constitutional disorder.

III. Persons of feeble constitution, whether congenital or acquired; persons with relaxed and flabby tissues and soft, sweaty skin; persons ill-nourished, whether from insufficient food, debilitating disease, or any other cause, are all peculiarly susceptible to the causes of disease in general and more especially to the exciting causes of bronchitis. Again, indulgence in alcoholic stimulants, even though it fall short of what is usually called intemperance, luxurious and slothful habits, neglect or timid avoidance of the bracing, invigorating

influences of open air and active exercise, all tend to produce a delicacy of frame and susceptibility to atmospheric vicissitudes, which strongly predispose persons who lead such unwholesome lives to suffer from bronchitis.

IV. A first attack of bronchitis, if at all severe, rarely fails to leave a liability to future recurrences of the disease, even though the cure may appear to have been complete. Organs which have once been the seat of inflammation are commonly prone to suffer from it again, and this applies more particularly to the bronchial mucous membrane, which is usually left delicate by an attack of bronchitis and very liable to a recurrence of inflammation from comparatively slight causes. Even a mild attack of bronchitis may thus, particularly after middle life, or in persons of delicate organisation, become the starting-point for repeated attacks. These attacks are very apt to recur with the commencement of cold weather, in the late autumn or early winter, and thus 'winter cough,' as it is called, becomes established. At first, perhaps, it may not seriously impair the general health, but it commonly increases in severity and duration with each succeeding recurrence, until at length it gradually passes into confirmed chronic bronchitis, with the impaired nutrition and other consequences which follow in its train.

V. Other organic diseases are often powerful predisposing causes of bronchitis. They act, I am disposed to think, exclusively by causing pulmonary hyperæmia, and their action is, perhaps, best exemplified in the effects of organic disease of the heart or lungs. Valvular lesions of the heart, which are attended by obstruction to the flow of blood from the lungs towards the left ventricle, produce a hyperæmic state of the lungs, which predisposes the bronchial membrane to take on inflammation from any slight exciting cause. Chronic pulmonary hyperæmia does also, indeed, in some cases, gradually develop catarrhal disease of the bronchial

membrane without the intervention of any discoverable exciting cause, and is one of the predisposing causes to which I have already referred as apt to do so when long enough in operation. More frequently, however, valvular disease of the heart, especially disease of the mitral valve, serves only to predispose persons to contract bronchitis from slight exposure, and therefore properly takes its place among the predisposing causes of that disease. Organic disease of any portion of the lungs themselves often serves to predispose the still healthy portions of those organs for bronchial disease. Pulmonary emphysema, chronic pneumonia, and tubercular deposits all so act by producing hyperæmia, either in the healthy tissue immediately adjoining the diseased part, or more extensively throughout the sound portions of the lung. Pulmonary emphysema, especially if it has not been preceded by bronchitis, rarely fails to be soon followed by it.

VI. Under the head of hereditary tendency, I have already adverted to the liability of persons who are the subjects of certain forms of constitutional disorder to suffer from bronchial disease. In many cases the dyscrasia does but constitute a predisposition which only results in bronchitis when an exciting cause comes into operation. The gouty and rheumatic diatheses, especially the former, are amongst the most powerful predisposing causes of bronchitis; and, we must rank as only secondary to these, albuminuria and chronic alcoholism. When the dyscrasia is very pronounced it probably produces a more direct influence upon the bronchial mucous membrane; for, in such conditions, just as in that of considerable and long-continued hyperæmia, we sometimes see bronchitis developed without the aid of any definite external exciting cause. In such cases the dyscrasia must be regarded as the true exciting cause of the disease. This applies, however, as I have said, only to a very limited

number of cases and obviously enough only to cases of secondary bronchitis.

Setting aside these last cases, the exciting causes of bronchitis are external and fall under two classes, namely:—

I. Those causes which act directly upon the mucous membrane itself;

II. Those causes which act indirectly through an influence exerted upon the external surface of the body.

I. Irritants which act immediately upon the bronchial membrane may produce inflammation by means either of mechanical or chemical irritation. Fine coal and metal dust, stone and porcelain grit, and even the flue of cotton, wool, or feathers, and similar soft substances which are inhaled into the lungs during various industrial processes, are all of them mechanical irritants which become fruitful causes of bronchitis among certain classes of operatives. In other cases, the inhalation of irritating vapours such as carbonic oxide, or of very cold damp air, or again of artificially heated and over dry air, will, if habitual, suffice to excite bronchitis without the existence of any definite predisposition.

II. Of the indirect causes which, acting through the medium of the skin, excite irritation of the bronchial membrane, cold, especially if conjoined with damp, is the most frequent; and its influence is to be measured, not by the degree of cold, but by the sensation of chilliness produced, which varies much in different persons and in the same person at different times. The nature of the exposure also, that is to say, the mode in which the cold is applied to the body, has a great influence upon the result. A cold draught of air passing over the surface, or the chilling of the skin by wet clothes, abstracts heat from the body more quickly and produces more serious consequences than exposure to the same degree of cold under other circumstances. The state of the

body at the time of exposure also influences the effect produced. Exposure to a certain degree of cold when the body is over-heated or exhausted by fatigue or fasting, produces a greater effect than when the body is in its ordinary condition. On the other hand, a vigorous state of the circulation, such as is produced by active but not exhausting exercise, and the habit of encountering atmospherical vicissitudes, will often prevent the evil consequences of exposure. Among the other most powerful exciting causes of bronchitis are the sitting for a length of time with wet feet, the getting wet through on a journey and remaining in damp clothes, and, the allowing clothes soaked with perspiration, by fatiguing exercise, to dry upon the body. Among the exciting causes of bronchitis must also be reckoned such more general and inevitable influences as sudden vicissitudes of weather, which often produces bronchial catarrh in many persons at the same time.

Bronchitis is frequently present in several of the acute specific fevers, when it cannot be referred to any apparent exciting cause or special predisposition. It is not uncommon in typhus, and it is very common in typhoid fever. In some of these cases it is due to the hypostatic congestion of the lungs, arising towards the close of the illness, from feeble circulation and the recumbent posture of the patient. In typhoid fever it so often occurs in the early stage that I am accustomed to regard it as almost a necessary incident of the disease. It may be severe, or it may be very slight, and, in the latter case, the sole evidence of its presence may be afforded by the detection of rhonchus or sibilus in the lungs on auscultation. In ordinary cases it is unimportant, and it commonly subsides as the patient begins to amend.

Notwithstanding the very diverse causes by which bronchitis is produced it is always, as I have already said, an inflammatory affection of the mucous membrane lining the



air-tubes, and is therefore always characterised by a similar train of symptoms, differing only in severity according to varieties in the site, extent, and duration of the disease. Thus the part and extent of the bronchial surface which is affected varies much in different cases, and this difference has a very important bearing upon the danger and urgency of the illness. The catarrh may be limited to the larger branches of the bronchial tree, or it may, on the other hand, extend into or even be almost confined to the smaller or capillary tubes. In the former case, it may scarcely interfere with the due performance of the function of respiration, and be attended by little suffering; in the latter case, it always interferes more or less with the respiratory process, and is attended by considerable distress. In the one case it is scarcely a dangerous disease, in the other it often proves speedily fatal. Again, as regards varieties of duration, bronchitis may be acute and run a comparatively short course, usually tending under favourable circumstances towards recovery; or it may be chronic, existing for lengthened periods, becoming gradually almost or altogether constant, and tending towards a fatal result. Thus, whatever may be the causes of bronchitis, there are three well-marked varieties of the disease, namely: simple acute bronchitis, capillary bronchitis, and chronic bronchitis.

Dismissing, for the present, from our consideration those forms of bronchitis which are secondary and arise either from some constitutional dyscrasia or from some pre-existing local disease, I propose in the first place to direct your attention to the three forms of bronchitis which I have just enumerated and in the order in which I have named them. At the same time I must tell you that, although these three classes of cases are clinically very distinct when we have to deal with typical cases, they also merge into one another by insensible degrees, there being numerous cases which present

a very mixed character. Thus bronchitis of the larger bronchial tubes may gradually extend downwards into the tubes of medium size, causing the accession of more urgent symptoms, or may even creep downwards along the mucous membrane until it involves the smaller twigs of the bronchial tree, or even the capillary tubes themselves; and so an ailment, which at the outset was comparatively unimportant, may be converted into a very distressing and dangerous illness. Again, an attack of acute bronchitis may be prolonged until it passes into the chronic and more unmanageable form of the disease; or lastly, on the other hand, a case previously chronic in its course and symptoms, may have an intercurrent exacerbation of acute bronchitis engrafted upon the chronic disease.

After these needful preliminary explanations, I proceed to consider simple acute bronchitis of the larger bronchial tubes. This form of the disease is ordinarily attended by little or no danger, and except for the fact that it frequently leaves the bronchial membrane unduly susceptible to exciting causes of bronchial disease, I should scarcely have deemed it necessary to occupy your time with its consideration. Viewed, however, as the possible prelude to more serious attacks of bronchial catarrh, which may end in chronic bronchitis and its secondary consequences, the study of simple acute bronchitis becomes very important, especially in reference to the best means of preventing future recurrences. As such cases are rarely admitted into the hospital, and we have none at present in the wards, I shall select as my illustrations two cases which were under my care some time ago.

CASE 2.—Marianne H., aged twenty years, by occupation a maid-servant, was admitted into Murray Ward on November 6, 1873. She had suffered three times from rheumatic fever, and in the last of these illnesses had been an inmate

of Northumberland Ward. With these exceptions she had been healthy, though rather liable to attacks of catarrh in winter, which, however, were always of short duration. She stated that her present illness had commenced with headache, soreness of throat, and pains in the limbs; to which, after a day or two, soreness of chest, cough, and expectoration had been superadded. A few days later she had lost her voice, and it was chiefly on this account that she had sought entrance into the hospital.

On admission she was suffering from hoarseness of voice and frequent short cough; the cough was loose, the expectoration being raised without much difficulty—it had already become opaque and concocted; there was slight difficulty of swallowing; the tonsils were enlarged, and the fauces were generally congested and swollen; the tongue was clean. The chest was everywhere normally resonant on percussion; on auscultation, the sound of expiration was more distinct and prolonged than in health, and there was loose mucous crepitation in the lower and posterior parts of both lungs—in other respects the breath-sounds were healthy; the heart-sounds were a little rough, but there was no definite murmur; pulse, 96; respirations, 20; temperature, 98·4°; urine, sp. gr. 1015, not albuminous.

When I first saw her she was already taking, every four hours, a draught containing 3 drachms of solution of acetate of ammonia, 10 minims of wine of ipecacuanha,  $\frac{1}{2}$  a drachm of compound tincture of camphor, and  $8\frac{1}{2}$  drachms of camphor water. I merely supplemented this treatment by ordering a wet compress to be applied round the throat, and an emetic, containing 1 scruple of powdered ipecacuanha and 1 grain of tartarised antimony, to be administered in the evening. No other treatment was required, and the patient was discharged convalescent at the expiration of ten days.

Before offering any comment upon this case, I will read

to you another case of mild simple bronchitis which came under observation at an earlier period of the illness.

CASE 3.—Theresa G., aged seventeen years, a well-nourished girl of fair complexion and healthy aspect, employed in the service of the hospital as a scrubber, was admitted into Murray Ward on November 1, 1872. Her father had died of consumption, but her mother, five brothers, and one sister were all living and in good health. The patient herself had also enjoyed good health, interrupted only by the usual diseases of infancy and by an attack of erysipelas about eighteen months previous to her present illness.

On admission, she said that she had been suffering for three days from frequent chilliness and *malaise*, and also from pains in the knees and ankles, and aching in the loins; but there was no swelling of any of the painful joints, and only very obscure and slight tenderness of the knees on pressure. She complained also of a sense of tightness and soreness of the chest, and of pain about the middle of the sternum when she coughed; the tongue was slightly red and injected at the edges, and was coated on the dorsum with a white creamy fur; the fauces were inflamed, and she had a frequent short cough, attended by scanty, transparent, frothy expectoration. The chest was everywhere normally resonant on percussion; on auscultation rhonchus was heard generally throughout both lungs, but no moist sounds were audible; the heart's impulse and sounds were healthy; pulse, 100; respirations, 20; temperature, 99·8°; urine, sp. gr. 1030, very turbid from a copious deposit of lithates, not albuminous.

She was ordered to take, every six hours, a draught containing 10 grains of chlorate of potash, 10 minims of diluted hydrochloric acid, and 1½ ounce of peppermint-water. This patient also rapidly recovered. On November 6 the pulse

had fallen to 66, the temperature to  $97.8^{\circ}$ , and the sp. gr. of the urine to 1015; the pains had altogether disappeared, the cough was much less troublesome, and the expectoration had become thick, opaque, and of a greenish colour. She was discharged well on November 15, a fortnight after her admission.

These two cases are good examples of ordinary, mild, and acute bronchitis implicating only the larger bronchial tubes. The patient whose case I read first had already passed through the earlier stages of the disease before she came under observation; the second was still in the early stage at the time of her admission, though apparently near its close. But although at different stages of their illness when they came into the wards, both patients presented the ordinary symptoms of this form of bronchitis, which ran the course it usually runs in healthy persons, ending in recovery about three weeks from its commencement. The illness of the second patient, and most probably that of the first likewise, began with chilliness and fever; but, in uncomplicated bronchitis affecting only the larger tubes, the fever is usually slight, and rarely lasts beyond three or four days. Accordingly, when Theresa G. was admitted into the hospital on the fourth day of her illness, the fever was already on the decline, though the pulse and temperature were still above the normal standard, and the urine was still of the feverish type, being of high specific gravity and loaded with acid lithates. Other prominent symptoms—that is to say, *malaise* or feeling of general discomfort, headache, pains in the back and limbs, and tightness and soreness of the chest with some degree of sore throat—were common to both cases; hoarseness and loss of voice, very common accompaniments of catarrhal bronchitis, existed in a marked degree in the first case, but were absent in the second. The presence or absence of these symptoms depends, probably, altogether

upon the degree in which the mucous membrane of the fauces and larynx participates in the catarrhal irritation. In other respects the symptoms in both patients were such as characterise the period of the disease at which they had respectively arrived. Theresa G., being still in the early stage of the disease, had a troublesome cough, and the expectoration was still scanty, transparent, frothy, and ropy; but in Marianne H., the disease having passed through the first stage, the cough had become loose, and the expectoration—which consisted of opaque, greenish, concocted masses—was more abundant. The physical signs in the two cases also corresponded with the stage of the catarrh. In Theresa G., the inflamed and swollen mucous membrane not having yet been relieved by free secretion, dry sounds only were heard on auscultation, and these, being entirely formed in the larger tubes, were grave and sonorous in character, constituting the sound called rhonchus; whereas, in Marianne H., the irritation having been already relieved by copious secretion lying free in the bronchial tubes, the bubbling sounds called crepitation had taken the place of the dry sounds which characterise the commencement of bronchial catarrh. The disease, in both these cases, being restricted to the larger bronchial tubes, there was no important obstruction to the admission of air into the bronchioles and air-cells, and, consequently, no impediment to the free performance of the function of respiration. Neither of these patients, therefore, suffered from dyspnoea.

The diagnosis of simple bronchitis was readily made in both cases, being founded upon the equal and normal expansion of the two sides of the chest in respiration and the unimpaired resonance on percussion, coupled with the dry snoring or cooing sounds heard on auscultation, in the one case, and the moist mucous crepitation heard in the other. Just as the dry sounds heard on auscultation are more or less

grave or sharp according to whether they are formed in the larger or smaller branches of the bronchial tree, so is the mucous crepitation coarser or finer according as it is formed in tubes of larger or smaller calibre; the bubbles formed in the larger tubes, with each act of respiration, being larger and fewer; those formed in the smaller tubes being smaller and more numerous.

I now proceed to draw your attention to a third case, in which the tubes of intermediate size were sufficiently implicated to cause some obstruction to the admission of air into the recesses of the lungs, and, consequently, to produce a considerable degree of dyspnoea.

CASE 4.—Elizabeth C., a married woman aged twenty-eight years, was admitted under my care on October 20, 1870. None of her immediate relatives had suffered from either phthisis, gout or rheumatism, but her mother and one sister were subject to winter cough, and the patient had herself suffered from rheumatic fever in childhood. From that time, however, her health had been uniformly good, until, at the age of twenty-five years, she had an attack of bronchitis and was laid up for five or six weeks. In the following year she had a second attack, from which also she entirely recovered, and remained well until the month of April 1870, when she again took cold and had a third and much more severe attack of bronchitis, from which she recovered less completely than from the previous attacks; for it left a little shortness of breath on exertion and occasional cough and expectoration in a morning. On October 13, she had again begun to experience symptoms of catarrh; her cough returned, and became so troublesome that she was induced to seek admission into the hospital.

This you will observe is a case which also illustrates what I have said respecting the hereditary nature of bronchitis, as also its tendency to recur again and again in the same indi-

vidual, and to become more severe at each successive recurrence, until it leads to some permanent change in the bronchial tubes. Although the patient's third attack of bronchitis had taken place in the spring, when the approach of warm weather might have seemed favourable to her recovery, she did not lose her bronchitic symptoms entirely, as she had done on the previous occasions. There remained a little morbid secretion from the bronchial tubes, exciting cough for its expulsion, and a certain degree of shortness of breath, which, though slight, was obvious to the patient herself, and was unquestionably an indication of some chronic change in the bronchial membrane. Probably in the earlier attacks, the bronchitis had, as in the two cases we have already considered, been restricted to the larger tubes, but in the third attack, which had left these slight symptoms of chronic disease, it had doubtless spread downwards into the smaller though not into the capillary tubes.

To resume the history of the patient. On admission she was suffering from a frequent short cough attended by a frothy, slightly opaque, ropy expectoration and by considerable dyspnoea. Her skin was moist; she complained of tightness in the chest and of pain in the mid-sternal region on coughing. Pulse; 96; respirations, 28; temperature, 101.0°. Urine, sp. gr. 1020, strongly acid, not albuminous. The movements of the chest in respiration were equal on the two sides; the expansion in ordinary breathing was imperfect, but good in forcible breathing. The percussion resonance was quite natural. On auscultation the sound of expiration was found to be prolonged and rhonchus and sibilus were heard, pretty generally, throughout both lungs; a few moist crepitations were also heard in the lower and posterior parts of both lungs.

Evidently, the bronchitis was already passing into the second stage; for the sputum, although still frothy and ropy,



was becoming opaque, and the moist crepitating sounds, characteristic of the stage of increased secretion, were already taking the place of the dry sounds which characterise the early stage of hyperæmia and irritation. I therefore prescribed a stimulating expectorant, consisting of 15 minims of tincture of squill, 2 drachms of solution of acetate of ammonia, 1 drachm of spirit of nitrous ether, 20 minims of tincture of henbane, and 11 drachms of pimento water, to be taken every six hours. I also directed the back of the chest to be covered with a warm linseed and mustard poultice. The cough having been particularly troublesome at night, and there being neither lividity of features, indicating imperfect aeration of the blood, nor any reason for suspecting the existence of renal disease, I also prescribed 5 grains of compound hemlock pill with  $\frac{1}{4}$  of a grain of hydrochlorate of morphia, to be taken each night at bedtime.

Next day the temperature had fallen to  $99.5^{\circ}$ ; the pulse was about 90; the respirations from 28 to 32. On October 26, it was noted that the patient had slept well and that the cough was much less troublesome. The expectoration, however, still continued frothy but was of an opaque grey colour, pulse 100, rather feeble; respirations, 28; temperature,  $98.0^{\circ}$ . There was rather large mucous crepitation in the bases of the lungs, and rhonchus was still audible in front. On the following day, the breathing in front of the chest was almost free from adventitious sounds, but the sound of expiration was still somewhat prolonged. The crepitation in the bases of the lungs was larger and drier.

From this time our patient steadily improved; the cough decreased much in frequency and the expectoration in quantity; the breathing became quite easy; the pulse fell to 76, the respirations to 24, and the temperature to  $98.4^{\circ}$ . A speedy recovery now appeared probable, but it was interrupted on November 3, by the occurrence of a dense London fog. She

then again began to experience dyspnoea; the cough became more frequent and the expectoration resumed its frothy character, and was much stained with soot; sibilus and rhonchus and increased mucous crepitation were again heard in the lungs on auscultation. Fortunately for the patient, the fog was of short duration, and she very speedily recovered the lost ground. A day or two afterwards she was ordered a slight tonic containing 1 drachm of compound tincture of gentian, 10 minims each of diluted nitro-hydrochloric acid and wine of ipecacuanha, 20 minims of tincture of henbane, and 1½ ounce of water, to be taken three times a day. The night pill, being now no longer required, was discontinued.

On November 9, the breath-sounds were rather feeble, but, with the exception of occasional slight rhonchus, were quite healthy. There was now scarcely any cough or expectoration; the latter consisted only of small pellets of opaque grey-coloured mucus still much tinged with soot. Pulse, 68; temperature, 98·9°; respirations, 23. Urine normal. A few days later the patient was discharged quite convalescent.

The three cases to which I have now directed your attention have all been examples of uncomplicated bronchitis; but I need scarcely remind you that bronchitis is very apt to be associated with other diseases, and with some of them so frequently that one cannot help regarding it as being either an independent result of the same cause, or as only another manifestation of the same morbid state. To the former of these classes must probably be assigned the frequent coincidence of bronchitis with acute renal dropsy, to the latter its frequent occurrence in the course of typhoid and rheumatic fevers. The following case is an instance of the first of these complications.

CASE 5.—James P., aged forty-nine, a spirit merchant's porter, was admitted into Founder Ward on October 9, 1872. He was an exceedingly stout man of sallow, bloated counten-

ance, who having originally possessed a good constitution had done all in his power to impair it. He had been long accustomed to drink beer, wine, and spirits in large quantities: his usual allowance having been from two and a half to three quarts of ale daily, besides a bottle and a half of port or sherry. His family history was excellent; for his father had died at the age of eighty-five years, his mother was still living at the age of ninety-five, and of nine brothers and sisters all were living and in good health, save one who had died from the consequences of an accident.

On Monday, October 5, the patient had felt chilly and had had slight rigors attended by pains in the back and limbs. On the following day he had experienced symptoms of catarrh, had begun to cough, and had felt some tightness and soreness of the chest and difficulty of breathing.

On admission, the chest was normally resonant on percussion over both its anterior and posterior aspects; the breath-sounds were rather harsh and accompanied by both sibilus and rhonchus, showing that the catarrh was not limited to the larger tubes. No moist sounds were audible. The heart's impulse and sounds were feeble; the liver was large, its area of dulness extending five and three quarter inches downwards from the fifth rib in the nipple line. The abdomen was large, but no effusion into the peritoneal cavity could be detected. Both the upper and lower extremities were slightly œdematous. Cough very troublesome; pulse, 104; temperature, 99.6°; urine, sp. gr. 1014, acid, yielding a distinct trace of albumen both with heat and nitric acid.

He was ordered to have curtains to his bed and to wear a flannel gown over his shirt, to have a poultice of linseed and mustard applied over the back of the chest, and to take every four hours a draught containing 2 drachms of solution of acetate of ammonia,  $\frac{1}{2}$  a drachm of spirit of nitrous ether, 15

minims of tincture of squills, and 1 ounce of carraway water. In the evening his pulse rose to 124, the respirations to 36, and the temperature to  $100\cdot4^{\circ}$ .

On the following day the cough still continued troublesome and abortive; the expectoration was scanty and frothy, and there was puffiness of the face. Pulse, 128; respirations, 34; temperature,  $100\cdot6^{\circ}$ . In addition to the treatment prescribed on the previous day, he was ordered to take early next morning  $1\frac{1}{2}$  ounce of compound senna draught with  $\frac{1}{2}$  a drachm of compound jalap powder.

On October 11, the breathing was more embarrassed, and the bronchitis had evidently spread more extensively downwards in the direction of the smaller tubes. Pulse, 112; respirations, 36; temperature,  $102\cdot4^{\circ}$ ; the urine, sp. gr. 1012, contained a full eighth part of albumen.

During the night the patient became noisy, delirious, and unmanageable, and his breathing very difficult. Mr. Lucas, the resident medical officer, gave him a draught containing 20 grains of chloral hydrate, which tranquillised him greatly. At the time of my visit next day, his breathing was still laborious and he was suffering from orthopnoea; sibilus and rhonchus were audible everywhere over the lungs, and there was now also a little crepitation in the posterior bases of both lungs. Pulse, 112; temperature,  $100\cdot4^{\circ}$ . I now ordered him a draught containing 1 ounce of infusion of senega, 4 grains of carbonate of ammonia, and 15 minims each of tincture of squill and spirit of ether, to be taken every six hours.

He soon began to improve; the urine, previously scanty, increased in quantity, and the proportion of albumen decreased. On the 13th the temperature fell to  $98\cdot6^{\circ}$ .

On October 19, his general condition had greatly improved, and the cough was much less troublesome; but the expectoration remained scanty, semi-transparent, and tenacious. On auscultation, the only adventitious sound heard

in the lungs was rhonchus, and this in the lower parts only; sibilus and crepitation being no longer audible in either lung. The urine, sp. gr. 1014, was abundant, amounting to 56 ounces in the twenty-four hours, and only contained a trace of albumen.

On October 24, there remained only slight cough, accompanied by scanty, opaque sputum containing much black pigment. The breath-sounds were quite natural; the urine was still abundant, more copious than in health, of low specific gravity, and quite free from albumen. He was now put upon generous diet, with iodide of iron as a tonic, and was discharged quite convalescent on November 11.

This case turned out much better than I had expected. Looking to the man's stout and puffy condition and to his previous mode of life, I feared that both the bronchitis and the renal disease would pass from the acute into the chronic form, whereas he appeared to recover perfectly from both with very unusual rapidity. A question might, indeed, not improperly be raised, as to whether the albuminuria, in this case, was not rather a secondary result of the bronchitis than a primary ailment. You have all, probably, seen albuminuria occur as a temporary incident of severe bronchitis attended by great pulmonary obstruction. In the present case, however, I am decidedly of opinion that the renal disorder was a complication and not a consequence of the lung disorder, and I am led to this conclusion not only by the very early manifestation of the albuminuria, accompanied by puffiness of the face and anasarca of both upper and lower extremities, but also by the subsequent course of the case, and especially by the greatly increased flow of urine as the albuminuria subsided; which is, as you are doubtless aware, a constant symptom at that stage of acute nephritis. The patient had evidently inherited a fine constitution which had not as yet been seriously impaired by his excesses, and which enabled

him to throw off two dangerous complaints without seeming to have incurred permanent damage to the affected organs.

You will have observed that I ordered him to have curtains to his bed and to wear a flannel gown. These may appear small matters for remark, but they really formed no unimportant part of the treatment. Whatever else we may do in such cases, we must never fail to adopt all possible precautions against the least chilling of the surface of the body, and to employ efficient means to promote the free action of the skin. I therefore invariably clothe such patients warmly, keep them in bed, and protect them from draughts of cold air.

In this patient, as in Elizabeth C., whose case I previously related, the bronchitis extended into the smaller, though not into the capillary tubes. Hence the distressing dyspnoea, at one time amounting to orthopnoea, and the sibilus or whistling sounds heard so extensively over the lungs. The expectoration was scanty throughout the illness, and, though it did at length become opaque, it never fully acquired the characters of the sputum coctum. The case, indeed, rather resembled, in some of its features, the *catarrh sec* of Laennec, and it affords an illustration of what I said in the beginning of my present lecture; namely, that although when we have to do with typical cases, the several forms of bronchitis, arranged according to the exact seat, extent, and duration of the disease, are clinically very distinct, yet these various forms, as we see them in practice, merge into each other by insensible degrees. Thus the last two cases I have related were, in fact, intermediate between simple catarrhal bronchitis, which occupied our attention during the earlier part of my present lecture, and capillary bronchitis, the consideration of which I must postpone to a future occasion. The same holds good with respect to the case I shall next relate.

Of the occurrence of bronchitis in typhoid fever we have at present several examples in the wards. In some of them

the cough has been slight, and the presence of the bronchial affection was only revealed by means of the sibilus and rhonchus heard in the lungs on auscultation. In two little boys, lying in beds Nos. 1 and 2 Founder Ward, the bronchitis formed a serious element in the illness; the cough having been very frequent and troublesome, and moist as well as dry sounds having been audible more or less widely over the lungs. Both these patients are now convalescent. There is also a man, occupying bed No. 5 in the same ward, who has suffered still more severely from this complication of bronchitis with typhoid fever; and of his case I will read you a rather full abstract.

CASE 6.—George P., aged twenty-seven years, a labourer by occupation, was admitted into Founder Ward on November 17, 1877. He had been ailing for about twelve days with severe frontal head-ache, pains in the limbs and loins and lower part of the abdomen, and occasional vomiting. For the last three days he had also been troubled with sore throat and cough. Had not had any diarrhoea.

On admission the pulse was 116; the temperature, 103·4°. The cheeks were flushed; the tongue was furred, but moist; the fauces were injected, but there was neither exudation upon their mucous membrane, nor swelling about the angles of the lower jaw; the abdomen was very slightly tympanitic, and there was neither tenderness on pressure nor gurgling in the right iliac region; two or three doubtful rose spots were found upon the back, none upon the abdomen; the breath-sounds were normal, with the exception of some sibilus and rhonchus; the first cardiac sound was prolonged and rather rough; the spleen was a little enlarged; the patient complained of sore throat and troublesome cough, and said that he had no expectoration.

The case went on for some days without any material change. On November 19, a few undoubted rose spots

appeared upon both the back and the abdomen; the temperature ranged from  $102.6^{\circ}$  to  $105.0^{\circ}$ , but was only on two or three occasions under  $103.0^{\circ}$ ; the pulse varied from 100 to 120, and the respirations from 28 to 36 in the minute; vomiting often recurred, but there was scarcely any diarrhoea and not much distension of the abdomen; the stools were of the typhoid character; the patient was delirious at night and often drowsy by day; the cough continued troublesome, and the sputum consisted of a clear, viscid, ropy mucus; rhonchus and sibilus, though chiefly the latter, were heard all over the chest; the urine presented at every examination a distinct trace of albumen.

November 22.—1.30 P.M. pulse, 120; respirations, 36; temperature,  $103.8^{\circ}$ ; tongue dry, rough, and fissured; abdomen slightly tympanitic, but free both from tenderness on pressure and gurgling; several fresh rose spots had appeared upon the back; the cough was still troublesome; the sputum was now a scanty, viscid, tenacious mucus of a grey colour streaked with bright blood; dry sounds were heard over the front of the lungs; small moist crepitation in the posterior bases.

November 27.—Pulse, 112; respirations, 30; temperature,  $103.0^{\circ}$ ; there was much muttering delirium; pupils dilated; tongue dry and fissured; abdomen soft; bowels open once only in the day; several fresh rose spots upon the back; chest everywhere normally resonant; abundant large crepitation and rhonchus heard in the bases of both lungs; cough less troublesome; sputum consisted of an opaque, gelatinous, grey mucus slightly streaked with blood.

December 4.—Patient much improved. 10 A.M. pulse, 90; temperature,  $98.8^{\circ}$ ; the cough was now paroxysmal, with long intervals of immunity; rhonchus and sibilus were still heard over both the front and back of the lungs, and a few crackles in the posterior bases.



From this date the patient has continued to improve steadily. The cough and expectoration have gradually ceased, and yesterday on auscultation, with the exception of slight crackling in the base of the right lung, the breath-sounds were healthy; the abdomen was soft and flaccid, and the bowels confined; the urine was also free from albumen and quite normal.

The treatment, in this case, has been adapted to the man's general condition. The diet has consisted exclusively of milk and of cold concentrated beef-tea, made with 1 lb. of minced beef-steak, 6 minims of hydrochloric acid, and 10 ozs. of cold water infused without the aid of heat. The early prostration rendered a resort to stimulants indispensable. At first small doses were administered every four hours; but, as necessity arose, the quantity was gradually increased until he had half an ounce of brandy every two hours. Considering the bronchial affection as in fact an integral part of the typhoid fever, though much more severe than usual, and believing, consequently, that it would subside with the fever, I did not employ any special treatment for it, but merely gave an occasional dose of a sedative linctus to mitigate the cough.

Observe, with reference to this case, that the patient had no hereditary nor personal predisposition for bronchitis, which must therefore be regarded as having been entirely due to the attack of typhoid fever from which he was suffering. The bronchitis extended into the smaller tubes, and with the exception of the prostration caused by the fever, constituted the most troublesome feature of the illness; but, as the patient had no previous tendency to bronchitis, and has now made a good recovery, I see no reason for anticipating that this attack will have left any liability for a recurrence of bronchial inflammation. There was at no time any dulness, or impaired resonance on percussion, over

the bases of the lungs, and I do not therefore think that hypostatic congestion had, in this case, any share in causing the bronchitis, which, as you will have observed, commenced at an early stage of the fever. In more protracted cases, however, as you are well aware, hypostatic congestion has sometimes an important influence in prolonging the bronchitis of typhoid fever, and may greatly conduce towards a fatal termination of the illness.

This appears to have been the case with the boy who died in bed No. 20 in Founder Ward yesterday. He was admitted into the hospital on October 11, being then at about the twenty-first day of the fever. He was extremely emaciated, had several bed-sores, and was altogether in a most unpromising state when he came under my care. The *alæ nasi* were in action, moist sounds were heard over the lungs, and the percussion resonance was much impaired over the back of the right lung. He recovered slowly from the fever, but never lost the bronchial symptoms, nor regained strength, and finally sank, apparently from the effects of the depression caused by the formation of a large abscess over the right elbow. At the post-mortem examination, however, we found the lower lobe of the right lung almost consolidated by catarrhal pneumonia and undergoing caseation.

And now, in conclusion, how should we treat acute bronchitis, and what means can we adopt to prevent future returns of the disease? A single attack of bronchitis, in such cases as those of Marianne H. and Theresa G., may, in itself, be attended by little discomfort or danger; but, as each attack leaves an increasing predisposition to recurrences of the disease, and as such recurrences rarely fail, in the course of time, to produce chronic affection of the bronchial membrane and its serious secondary consequences, the proper treatment of even a slight attack of acute bronchial catarrh

is of great importance as regards the future welfare of the patient.

If there be fever, the patient should be kept in bed and on light food for a day or two until it subsides. If there be no fever, confinement to bed may be unnecessary, but the patient should at any rate, if possible, remain indoors for a day or two, and occupy an apartment kept at an equable but moderate temperature. Over-heated rooms and cold draughts of air are to be equally avoided. Neither is it desirable to clothe too warmly. If the patient be chilly, bed is the proper place for him, and putting on a large quantity of extra clothing only tends to render him more susceptible to the consequences of exposure when he gets out again.

Some diaphoretic medicine, such as 2 or 3 drachms of solution of acetate of ammonia, with from 10 to 20 minims of antimonial wine and  $1\frac{1}{2}$  ounce of camphor water, should be given every four or six hours. If the cough should be troublesome, either a drachm of syrup of poppy or from 20 to 30 minims of compound tincture of camphor may be added to the draught. A sinapism or a poultice of linseed and mustard applied over the sternum at night will also be useful, particularly if there be pain or tightness of the chest. This treatment will rarely fail to assist the solution of the bronchial inflammation and shorten the duration of the illness.

When the acute symptoms have subsided and the expectoration has become opaque, or of a yellow colour, tincture of squills may be advantageously substituted for the antimonial wine, which is, as a rule, the best expectorant during the early stage of the bronchial catarrh. It is, however, sometimes too depressing for feeble or flabby persons and, in such cases, wine of ipecacuaha, in doses of from 5 to 15 minims, often proves a good substitute. During the decline of the catarrh some tonic will generally be found useful. If, as

often occurs at this period of the illness, the skin is open and the patient perspires readily on exertion, the mineral acids will answer the purpose best. I usually prefer the diluted nitro-hydrochloric acid, and of this I commonly give 10 minims, in combination with a bitter infusion, such as chiretta or calumba, for a week or ten days during convalescence, with good effect. In other cases quinine answers best, and the tincture is at once the most convenient and agreeable form in which to administer it. In anæmic persons iron may be advantageously combined with the quinine in the form of citrate of quinine and iron. When there is much muscular debility, I have found tincture of perchloride of iron, in doses of 10 or 15 minims with 3 or 4 minims of solution of strychnia, given twice or thrice a day, very beneficial.

Medical aid is rarely sought for in cases of bronchial catarrh until the disease has become fully developed, but when a patient is seen at the outset of the illness various means may be employed with a view to cutting short the course of the catarrh. One of these is to give full doses of quinine at the very commencement of the catarrhal symptoms. In the case of adults I generally prescribe  $\frac{1}{2}$  an ounce of the tincture for the first dose, following it up with 2-drachm doses every six hours for two or three days; for children of course the dose must be modified according to their age. I have found this treatment especially useful in delicate young people, and it possesses the great advantage of not tending to produce depression. Another plan which, like the former, must be put in force at the very commencement of the catarrh, if it is to be effectual in cutting it short, consists in giving a full dose of opium at bed-time for one, two, or three nights. I usually prescribe it in combination with diaphoretics in the form of a draught containing  $\frac{1}{2}$  an ounce of solution of acetate of ammonia, 1 drachm each of antimonial

wine, spirit of nitrous ether and syrup of red poppy,  $\frac{1}{2}$  an ounce of compound tincture of camphor, and a sufficiency of camphor water. This dose may be repeated on two subsequent nights, or if, as often happens, the first dose greatly checks the catarrh, the second and third doses may be only half the strength of the first. On the morning after the last opiate a mild saline aperient is generally advisable, and a little simple effervescing medicine made with fresh lemon juice and bicarbonate of soda, or a draught containing 10 grains of chlorate of potash, 10 minims of diluted hydrochloric acid and  $1\frac{1}{2}$  ounce of peppermint water, given three or four times a day, will be useful and grateful to the patient. Now and then I substitute a full dose of Dover's powder and a couple of grains of calomel for the sedative draught at bed-time, following it up with a dose of compound senna draught or a seidlitz powder on the following morning; but I need scarcely say that I do not repeat the calomel on the second and third nights.

I can speak with much confidence of the efficacy of this mode of treatment in cutting short a mild attack of acute bronchitis. Its immediate effect is to produce copious diaphoresis, which may be promoted by putting the feet for ten minutes, immediately before getting into bed, into a hot foot-bath with a table-spoonful of mustard well diffused through it. A patient who has gone to bed with coryza, cough, and rawness or tightness of the chest will frequently awake next morning greatly relieved; there will be a little sense of stuffiness of the chest, but the cough will be loose and the discharge from the bronchial and nasal passages much thicker and less acrid. In the course of the following day there may be a slight return of catarrhal irritation, but the repetition of the treatment for a second, and if necessary, for a third night, rarely fails to effect a cure in the acute bronchial catarrh of healthy persons. The diet during this

treatment should be light, and stimulants should be either entirely abstained from or taken in very moderate quantities.

It still remains to say a few words as to the best means of preventing recurrences of bronchial catarrh, for, considering the susceptibility of persons who have once had an attack to returns of this disease, our work is only half done when we have carried our patient well through a first attack. The means most commonly, but as I think mistakenly, adopted for this purpose, are those which aim at protecting the patient, by extreme care, from all possible external exciting causes of the disease. Extra clothing is heaped on, open windows are forbidden, draughts are excluded, and all access of cold air, or even of cold water, to the surface of the body is scrupulously avoided. Undoubtedly there are persons of such feeble constitution and languid circulation that they require many of these precautions, but they form only a very small minority of our bronchitic patients; and I am convinced that such hot-house treatment, unless absolutely requisite, does but tend to increase the susceptibility for catching cold left by a first attack of bronchitis, and then the accidental, perhaps unavoidable neglect of some of these accustomed precautions, readily leads to a recurrence of the disease. It should, also, be borne in mind that bronchitis is excited not so much by exposure to any particular degree of cold as to alternations of temperature; and a patient confined to his room sometimes feels changes of weather more than those who go abroad. Indeed, persons who live in heated rooms, and screen themselves from every draught of air, sometimes become so susceptible that even the accidental cooling of the apartment proves as injurious as a much more serious exposure would do to persons of ordinary habits.

In my experience a much more rational and effective means of preventing recurrences of bronchial catarrh consists, in the first place, in putting the patient on a plan of

treatment calculated to invigorate the system, and especially to keep up the activity of the circulation and give tone to the bronchial membrane; and, secondly, in gradually and judiciously inducing him to inure himself to vicissitudes of temperature which in no circumstances can be entirely avoided, and which, in the necessary business of life, must often be daily encountered. With this view, as soon as a patient, otherwise a healthy subject, has thoroughly recovered from a first attack of bronchitis, I recommend active open air exercise, good nourishment, and, if needful, some tonic such as the tincture of perchloride of iron already mentioned; but especially, what is perhaps the most important of all, the daily use of a cold sponge or shower-bath. At first it may be necessary to use the bath tepid, but the temperature of the water may almost invariably be gradually reduced, until, after a little time, the patient can bear a cold bath and feel a refreshing glow after its use. The efficacy of the bath will be enhanced if the surface of the body be afterwards rubbed with a coarse towel or a flesh brush. When the patient has become accustomed to the use of the cold bath, he will be less liable to take cold from external influences and may begin with due care to encounter vicissitudes of temperature in the open air. I have watched the good effects of this invigorating system of treatment in so many persons, and even in delicate persons who had already suffered from several attacks of the disease, that I have no hesitation in recommending it as the most effectual means of preventing returns of bronchitis in all persons of tolerable health or strength; though, of course, I need scarcely say that there will always be some patients whose circulation is so feeble, or whose health is otherwise so impaired, that their cases must be exceptionally dealt with.

## LECTURE III.

## CAPILLARY BRONCHITIS.

CAUSES OF URGENT DYSPNŒA ; ORTHOPNŒA—LABORIOUS RESPIRATION—IMPERFECT AERATION OF BLOOD ; VENOUS CONGESTION—CAUSES OF PHYSICAL SIGNS—ACUTE EMPHYSEMA—INTERRUPTED ARTICULATION—DELIRIUM—ASTHMATIC PAROXYSMS—ALBUMINURIA—HYPERTROPHY OF THE RIGHT VENTRICLE—CAPILLARY BRONCHITIS OFTEN ASSOCIATED WITH CHRONIC RENAL DISEASE OR VALVULAR DISEASE OF THE HEART—CAPILLARY BRONCHITIS AND CHRONIC OR DORMANT PHTHISIS—TREATMENT.

GENTLEMEN,—I told you, in a former lecture, that when catarrhal inflammation affects only the larger and middle-sized bronchial tubes, dyspnœa is either altogether absent or exists only in a very moderate degree. The swelling of the inflamed bronchia membrane, and the mucus secreted by it, cannot block up the tubes of larger calibre sufficiently to interfere, in any great degree, with the passage of air towards the air-cells ; and the function of respiration is, therefore, in this class of cases, but slightly impeded. This immunity from distress ceases, however, so soon as the inflammation attacks the smaller bronchial tubes ; and, in proportion to the degree in which it extends into the capillary tubes, the symptoms of dyspnœa become more and more urgent ; for, as you will easily understand, an amount of swelling which would cause little appreciable change in the calibre of the larger bronchial tubes, would so greatly diminish that of the capillary tubes as to interfere very materially with the passage of air through them into the air-cells. From this cause arise the much more distressing symptoms and the



much greater danger of capillary bronchitis as compared with bronchitis affecting only the larger bronchial tubes.

The air being unable, as we have seen, to reach the air-cells in sufficient quantity, the blood can, of course, be only imperfectly aerated, and more or less pronounced symptoms of asphyxia supervene. In order to overcome these, stronger efforts at inspiration are instinctively made to increase the quantity of air inhaled, and in slight cases this may be effected by increased frequency of respiration: a frequency which in children may, in severe cases, attain from 60 to 80, in adults from 40 to 50, in the minute. In more urgent cases the breathing becomes difficult and laboured, the accessory muscles of respiration are brought into operation, the *alæ nasi* dilate with each inspiration, and the patient suffers from orthopnoea—that is to say, is obliged to sit upright in order to facilitate the greatest possible expansion of the thorax. And now, on inspection of the exposed thorax, a great change is observed in the mechanism of respiration. Inspiration is performed in a laborious, spasmodic manner, instead of by the very gradual expansion of the chest seen in health; the scalene and sterno-cleido-mastoid muscles are firmly contracted during the act of inspiration, and several other auxiliary muscles of respiration are brought into play. These violent inspiratory efforts are, however, seen to be inefficient; they do, indeed, expand the chest-walls, but they cannot overcome the obstacles to the passage of air through the capillary tubes, and therefore fresh air does not enter the air-cells freely enough to fill them and carry on healthy respiration. We then sometimes see the epigastrium retracted, the lower ribs drawn inwards so that the size of the waist is diminished, and even the super-clavicular spaces sink downwards, forming cup-like cavities, during the act of inspiration.

The blood, being thus imperfectly aerated, is not properly

decarbonised. From this cause, and from the imperfect and laborious manner in which respiration is performed, the blood circulates less freely through the lungs, the arterial tension becomes diminished and venous congestion ensues. The veins of the neck become distended and beaded; the fingers, lips, tips of the nose and ears become blue, and the face pallid; the right side of the heart becomes distended; the area of cardiac dulness becomes enlarged; and even a notable increase in the transverse diameter of the heart may sometimes be observed.

Capillary bronchitis, in a severe form, is in fact a very formidable and dangerous disease even to adults and robust persons, whilst among children and aged and feeble persons it is too frequently fatal; happily it is far less common than bronchitis in the larger tubes. It may easily be diagnosed by the presence of some or all of the distressing symptoms I have described. I will read you, as an instance of the slighter form of the disease, the case of a patient who was under my care in Murray Ward nearly two years ago.

CASE 7.—Jane M., a married woman aged thirty-three years, a dressmaker by occupation, was admitted on November 16, 1875. Her father had been subject to gout, and died at the age of sixty; her mother died of consumption at the age of fifty years. The patient herself had suffered for some years from winter cough attended by shortness of breath, the attacks being always referable to a definite exposure. On November 14 she was caught in the rain, and got wet through; very shortly afterwards she began to cough and to experience shortness of breath.

On admission, the patient complained of headache; her pulse was 152; the respirations, 42; temperature, 103·8°; her breathing was laboured, and so difficult that she could not lie down; her aspect was anxious; her face livid and pallid; her lips and tongue blue; the chest was everywhere

normally resonant; small crepitation and sibilus were heard over both the back and front of the lungs, and equally on either side; the expiration was prolonged and sibilant; the heart-sounds were healthy; the cough was paroxysmal; and the sputum consisted of opaque, greenish, somewhat tenacious masses, floating in a frothy fluid.

I prescribed a diaphoretic draught containing 2 drachms of solution of acetate of ammonia, 10 minims of antimonial wine and camphor water, to be taken every four hours; and a draught, with 1 drachm each of syrup of tolu and aromatic spirit of ammonia,  $\frac{1}{2}$  a drachm of spirit of ether, and 9 drachms of camphor water, to be taken from time to time when the dyspnœa became more urgent. I also directed her to inhale frequently the steam of hot water.

In the evening the pulse had fallen to 136, and the temperature to  $102.8^{\circ}$ ; the respirations were 40; urine, sp. gr. 1015, acid, not albuminous.

November 17.—Pulse, 118; temperature,  $100.3^{\circ}$ ; respirations, 30.

She improved rapidly. On November 19 the pulse was 100; respirations, 23; temperature,  $98.8^{\circ}$ . Having been much disturbed by cough she had slept badly, but her breathing had become easier, and she was able to lie down. The dyspnœa now tended to be paroxysmal, and I prescribed a pill, consisting of  $\frac{1}{3}$  of a grain of extract of stramonium and 5 grains of compound hemlock pill, to be taken every night at bedtime; and directed her to inhale 1 drachm of ether, from an inhaler filled with hot water, whenever the breathing became laborious.

On November 24 the improvement continued, but sibilus and small crepitation were still heard in the posterior and lower parts of both lungs, and sibilus over the front of the chest. She was ordered to take, every six hours, a draught containing 4 grains of carbonate of ammonia, 15 minims of

tincture of squill,  $\frac{1}{2}$  an ounce of pimento water, and 1 ounce of infusion of senega.

November 28.—She could now sleep well in the recumbent posture, but her cough was still troublesome and the sputum copious, thin, and frothy; dry bronchitic sounds and small crepitation were heard in front of the chest, and abundant small crepitation in the posterior bases of both lungs; percussion resonance unimpaired; pulse, 115; temperature,  $98.7^{\circ}$ ; urine normal. She complained of tightness of the chest and pain between the shoulders, and still had attacks of spasmodic dyspnoea at night, which were, however, always relieved by the ether inhalation.

December 3.—Pulse, 100; temperature,  $98.4^{\circ}$ ; there was still small crepitation in the bases of the lungs, but the breath-sounds in front were free, and the percussion note and vocal vibration and resonance were all of them normal; the sputum continued copious. I now, with the purpose of diminishing the amount of expectoration, prescribed a draught, to be taken three times a day, containing 1 drachm each of syrup of tolu and mucilage of tragacanth, 20 minims of tincture of larch, and 10 drachms of water.

December 18.—Cough less troublesome; sputum much less copious, consisting of frothy, slightly tenacious, semi-transparent mucus. From this time, notwithstanding various alternations, the patient progressed towards recovery, and was discharged quite well on January 17, 1876.

This was not by any means a very severe case of capillary bronchitis, but it presented, nevertheless, most of the prominent symptoms of that disease. The orthopnoea, the pallid countenance, and the livid lips and tongue were quite characteristic: the physical signs were equally so. The chest was quite normally resonant on percussion; for, although there was difficulty in the passage of air through the smaller tubes, there was no actual deficiency of air in

the air-cells. The expiration and inspiration were both performed imperfectly and with difficulty, and, consequently, there was an insufficient renewal of the air in the lungs, and a great want of fresh air; but the usual quantity of air in the air-cells was certainly not diminished, and the sound elicited by percussion was therefore as clear as in health. The insufficient renewal of air in the lungs was the cause of the quickened and difficult breathing; there was what the Germans very expressively call an 'air hunger,' and efforts to increase the supply of fresh air by forcible breathing were instinctively made. The narrowing of the channels through which the air had to pass on its way to the recesses of the lungs, produced the sibilus heard on auscultation, and the same obstacles encountered by the air on its return from the air-cells, prolonged the act of expiration and made it abnormally audible; whilst the presence of abundant secretion in the smaller tubes, through which the air bubbled in its passage to and from the lungs, caused the small crepitation which persisted so long after the more urgent symptoms had abated.

The illness was acute. There was, at the outset, considerable fever, a very frequent pulse, and quick respiration; but the fever was only of short duration, the temperature having rapidly fallen to the natural standard in the course of a very few days. This, you will recollect, is usual in bronchitis, in which the fever is rarely either very high or of long duration. The frequency of the pulse was out of all proportion to the temperature, and it continued for some days after the febrile temperature had subsided. The respiration was also much accelerated. In any other disease this frequency would have caused much uneasiness, but frequent pulse and respiration are the rule in capillary bronchitis; and, though they certainly afforded evidence of the severity of the illness, yet, the prognosis in this disease being mainly founded upon the

amount of obstruction to the process of respiration, their rapidity was a much less serious symptom than it would have been in some other diseases.

The case was one of capillary bronchitis from the first. The patient came under my care only two days after her definite exposure to cold, and already the disease was fully developed in the capillary tubes. Without doubt, the liability of the patient to winter cough had produced a strong predisposition to bronchitis, which had on this occasion at once invaded the smaller tubes. When she was admitted into the hospital, the physical signs and constitutional symptoms were exclusively those of capillary bronchitis; though, at a later period, the copious frothy sputum showed that the larger tubes had also been implicated in the catarrhal process.

We have at present a child, in Murray Ward, suffering from capillary bronchitis. The case is even less severe than the one I have just related, but, like it, presents a good picture of the disease in its more manageable form. Many of you have already had your attention directed to the case, when accompanying me in my ward visit, and therefore I shall only recall to you the main facts from the case book.

CASE 8.—William T., aged four years, was admitted on November 26th, 1877. His family history was quite satisfactory, and showed no tendency to any form of disease. His own health had also been good. He had been taken ill only two days before his admission; at first he had rigors, of very short duration, and headache. In the course of the same day he began to cough and suffer from dyspnoea.

On admission the pulse was 160; the respirations 76; the temperature 103.4°. The cheeks were flushed; tongue furred but moist; breathing short, hurried and laboured; *alæ nasi* working; great restlessness; short, harsh, frequent cough; no expectoration. Chest everywhere normally re-

sonant on percussion; moist, small crepitation and sibilus were heard over both lungs; the heart-sounds were normal. The little patient complained of some tightness and soreness of the mid-sternal region. I ordered curtains to his bed; and prescribed a draught containing half a drachm of solution of acetate of ammonia, 5 minims of antimonial wine, 20 minims of syrup of poppy, and  $3\frac{1}{2}$  drachms of water, to be taken every four hours. At 10 P.M., the pulse was 156; the respirations were 44; and the temperature  $100\cdot4^{\circ}$ . The breathing was manifestly easier, but the *alæ nasi* still dilated with each inspiration. The cough was frequent, prolonged, and abortive; and it had several times ended in vomiting.

November 27.—10 A.M., pulse, 150; respirations, 42; temperature,  $98\cdot0^{\circ}$ . Cough less frequent; breathing still laboured, *alæ nasi* still in action during inspiration. Tongue furred; skin moist; bowels open, urine, sp. gr. 1025, acid, not albuminous. In the afternoon the temperature rose to  $101\cdot2^{\circ}$ , but fell again at night to  $98\cdot2^{\circ}$ .

November 28.—Pulse, 132; respirations, 40; temperature,  $98\cdot2^{\circ}$ . Voice hoarse; cough short and abortive; tongue furred; face flushed. Resonance on percussion normal, perhaps a little high-pitched; abundant small bubbling crepitation over back of lungs and in the infra-mammary regions.

From this time the temperature remained rather under the normal standard, ranging from  $97\cdot0^{\circ}$  to  $98\cdot4^{\circ}$ ; but the pulse and respiration continued frequent until December 6th, when the pulse fell to 96 and the respirations to 26 in the minute. On that day the breath-sounds, generally, were almost normal; but there still remained slight crepitation in the lower lobe of the right lung. The little patient is now convalescent, and will leave us quite well in the course of a few days.

In this case, again, observe the high range of the pulse, respiration and temperature, and also the speedy fall of the

latter about the third day. The case was only a mild one, but it was, I believe, saved from becoming serious by early admission into the hospital, ensuring greater care and the avoidance of exposure to cold.

The disease in this case, as well as in the previous one, appears to have commenced at once in the smaller tubes. More commonly, when capillary bronchitis occurs in persons free from any other lung disease, the catarrh begins in the larger tubes, from whence it spreads gradually, and often insidiously, downwards into the capillary tubes. Hence it often happens that the true nature of the case is overlooked, until it has assumed a severe and threatening form. The illness being regarded as a common cold, it receives little attention until the breathing has become much embarrassed, and symptoms of an asphyxial character have supervened. A case that was in Founder Ward early in the present year, exemplified this more frequent course of the disease. It also presented several symptoms which did not occur in either of the cases I have related.

CASE 9.—Frank B., aged 21 years, an engraver by occupation, was admitted into the hospital on February 4th, 1877. His parents and brothers and sisters were all alive and healthy. The patient himself had also enjoyed uninterrupted good health, until his present illness; but, he had been leading a dissipated life for several months, and had drunk very freely. His illness began with a protracted fit of shivering, which was followed by a severe cold and cough, a feeling of tightness across the chest, and some slight difficulty of breathing. For these symptoms he had sought medical advice, but had meanwhile continued his irregular mode of life. Twenty-four hours before presenting himself at the hospital, his breathing had gradually become more difficult, and his chest more painful.

On admission the patient was sweating profusely; his



countenance was pallid, and there was slight lividity of the lips, tongue, tips of the ears, nose and fingers. The pulse was 92, small and weak; respirations, 44; temperature, 97·8°. The breathing was laboured; the *alæ nasi* being in action with each inspiration. Abundant dry sounds, more especially sibilus, and a few moist crepitations were heard over the front of the chest. The heart-sounds were masked, but apparently clean. The sputum was copious, and consisted merely of a frothy fluid.

He was ordered to have a mustard and linseed poultice applied over the chest; to use, from time to time, hot water inhalations, with 1 drachm of spirit of ether in each; and, to take every four hours a draught containing 4 grains of carbonate of ammonia, 15 minims of tincture of squills,  $\frac{1}{2}$  an ounce of pimento water, and 1 ounce of infusion of senega. He was also ordered 2 ounces of brandy daily.

I did not see the patient until the day after his admission, when I took the following note:—

February 5.—Pulse, 102, weak; respirations, 45; temperature, 98·6°. Urine, sp. gr. 1006, acid, not albuminous. Patient had slept badly, and had been wandering in mind. Respirations short, gasping and almost entirely abdominal, there being very little expansion of the chest. There was excess of resonance on percussion over both the anterior and posterior aspects of the chest. The lung resonance encroached upon the *præcordia*, and also extended below the normal line on the right side, displacing the liver downwards. Sibilus and some rhonchus were heard over the back of both lungs; sibilus only over the front. The breathing was very laborious; the cheeks had a dusky flush, and the lips were livid. The breathing was so short that the articulation was broken and interrupted; the patient being obliged to pause and take breath in the middle of a sentence. The cough was frequent and abortive; the sputum, which consisted of grey masses

floating in a frothy liquid, being raised only after very distressing efforts. The patient said that he had occasional attacks of dyspnœa, during which he felt choked and his chest became painfully tight.

I prescribed a draught containing 2 drachms of solution of acetate of ammonia, 15 minims of antimonial wine, 1 drachm of syrup of poppy and 9 drachms of camphor water, to be taken every four hours. I also ordered a full dose of compound senna mixture to be given at once; and continued the inhalation of ether and the poultice over the back of the chest.

9.30 P.M.—Pulse 88; respirations 28; temperature 98.4°. The bowels had been freely purged; the breathing was much quieter; the cough much less troublesome, and the pulse greatly improved in force.

February 6.—The patient had had three hours of good sleep in the night; had wandered a little on awaking, but had not been noisy. Complained of headache. Pulse 92, full and steady; temperature 97.8°; tongue furred; urine sp. gr. 1008, acid, not albuminous. Cough much better; sputum becoming opaque, muco-purulent and slightly streaked with blood. The resonance was now normal; rhonchus and a few crackles were heard over the front of the lungs; and some dry cooing sounds over the back. The breathing was still somewhat laboured, but the expansion of the chest had improved.

Towards evening the cough and breathing became more troublesome again, but were relieved by the inhalation of ether. The patient being sleepless and restless as night came on, a draught containing 20 grains of hydrate of chloral was administered to him with the effect of procuring several hours of good sleep.

February 8.—Pulse 88; respirations 28; temperature 98.2°. Slept well without any sedative. Breathing improved; dry sounds over both lungs; percussion resonance normal.

Feb. 9th.—Pulse 72; respirations 28; temperature 97·8°. Patient had a slight attack of spasmodic dyspnoea during the night, which was relieved, as usual, by the inhalation of ether. In other respects he is going on well. I prescribed a draught containing 5 grains each of iodide of potassium and carbonate of ammonia, 10 minims of tincture of squills, one drachm of syrup of tolu, and 1½ ounce of camphor water, to be taken three times a day.

Feb. 10th.—On the evening of this day the patient had a relapse; his fauces became injected, and the bronchial symptoms were aggravated. He became very restless, delirious, and unmanageable, and would not remain in bed. He was so noisy that it became necessary, for the welfare of the other patients, to remove him to a separate ward. In the course of the night his breathing became laborious, and mixed dry and moist sounds were heard over the chest. After a violent fit of coughing he expectorated a large quantity of frothy sputum, and his breathing became quieter, but he still remained delirious. Bromide of potassium and tincture of henbane were administered at intervals, and he slept for several hours. He subsequently made a good recovery, and was discharged at his own request, fairly well, on Feb. 27th.

This was a primary attack of capillary bronchitis in a previously healthy person. It commenced as a catarrh of the bronchial tubes, from whence it extended downwards into the capillary tubes. The febrile stage had already passed off when the patient came under our observation, but the case was in all other respects a characteristic one. The nature of the sputum, which consisted of a few grey tenacious masses floating in a copious frothy liquid, showed that the larger tubes participated in the catarrhal process.

When the patient was admitted some of the physical signs were suggestive of the presence of pulmonary emphysema. The extremely clear resonance on percussion, the ex-

tended area of lung resonance, and the deficient expansion of the thorax during inspiration, were all of them signs commonly observed in emphysema. They all, however, subsided before the patient was discharged; proving that there was no permanent dilatation of the air-cells. These signs arose from the extreme distension of the lungs consequent upon insufficient expiration, and the condition which gives rise to them is sometimes called acute emphysema. Frequent repetition of such distension of the air-cells would, undoubtedly, tend to produce permanent dilatation of the lungs; but in most similar cases the condition subsides with the bronchitis which occasioned it. The distended and over voluminous lungs not only over-lapped the heart, but also pushed the liver downwards; and, although the fact is not noted in the clinical report, the liver was most probably tender, as it is in a somewhat analogous case at present occupying bed No. 17 in Founder Ward.

The interrupted articulation of sentences, which was a very striking feature of this case, is rather uncommon in so marked a degree in bronchitis, though very frequent in pneumonia. It arises from the actual want of sufficient breath to speak a complete sentence, without taking a fresh inspiration. Delirium is often present in capillary bronchitis, being due to the imperfect oxygenation of the blood with which the brain is supplied, but it was more active and noisy in this man than in ordinary cases, perhaps because his lately acquired habits of intemperance had rendered his brain unusually irritable.

Attacks of dyspnœa of an asthmatic character, such as those from which this patient suffered, are of frequent occurrence in capillary bronchitis. They are unquestionably often of nervous origin, and are then immediately caused by spasm of the smaller bronchial tubes. For the relief of this spasmodic form of dyspnœa, I have been accustomed for many

years, to recommend the inhalation of the vapour of ether mixed with that of hot water with great advantage. In other instances the dyspnoea is due to an accumulation of mucus in the bronchioles, as was sometimes obviously the case in our patient, whose dyspnoea, as you will remember, was on several occasions greatly relieved after a violent fit of coughing, accompanied by a copious expectoration of frothy mucus.

The increased volume of the lungs, caused by over-distension with air, to which I have referred in the last case, was well exemplified in a patient who died some time since in Murray Ward. It was a case of capillary engrafted upon old-standing chronic bronchitis, but the acute stage was already over when the patient came into the hospital.

CASE 10.—Harriet B., a married woman aged twenty-seven years, was admitted into Murray Ward, on January 18, 1875. Her family history showed a tendency to pulmonary disease; her mother having died of bronchitis, and two sisters of phthisis. The patient herself had also been subject to cold and cough in winter for several years. She had usually lost her cough in summer until the summer preceding her last illness, during which she had never been altogether free from cough and shortness of breath. She had taken cold shortly before Christmas, and had got progressively worse until at length she sought relief at the Middlesex Hospital.

On admission the pulse was 138; the respirations were 42 in a minute; and the temperature was 98.4°. The countenance was very dusky and the lips blue. The breath sounds were rough and harsh, the expiration prolonged and sibilant. Small crepitation was heard in the posterior bases of both lungs. The sputum consisted of an opaque mucopurulent secretion. The heart sounds were clean. The urine, of sp. gr. 1008, showed a trace of albumen. A draught containing infusion of senega, tincture of squills, and spirit of

ether was prescribed, and she was directed to inhale the steam of hot water at frequent intervals. She was also ordered 4 ounces of brandy daily.

When I saw her, on the day after admission, her countenance was very livid, and her breathing very laboured, compelling her to maintain the upright position in bed. She complained of palpitation; the heart's action was violent and its impulse forcible, but, nevertheless, the pulse at the wrist was feeble. The urine now contained a full sixth part of albumen.

It is unnecessary, for my present purpose, to follow all the details of the case; the patient became progressively worse from day to day. On January 24 pulsation was observed in the veins of the neck and the eyes were prominent. She died on January 28.

At the post-mortem examination, the body was observed to be well nourished. The liver was pushed downwards almost below the margin of the ribs. The lungs were inflated as if at the end of a full inspiration. They were quite free from adhesions, and maintained their state of inflation after removal from the thorax. Save along their lower borders, which were fringed with a row of minute bead-like vesicles, they were not emphysematous. A few defined patches of collapsed lung existed along the posterior margins of each lung. Although healthy in appearance, the lungs were nowhere normally crepitant, but were soft to the touch, and on section were found to be generally congested. The bronchial tubes down to their finest divisions were plugged with tenacious opaque mucus.

The heart was enlarged and dilated, but all the valves were competent; the wall of the right ventricle was thicker and tougher than normal. The mucous membrane of the stomach was coated with adherent, thick mucus; it was thick, soft, and of purple colour, presenting numerous capil-

lary extravasations. Similar extravasations existed in the ileum. The liver and spleen were both tough and indurated.

As I have said, the febrile stage had passed off before the woman came into the hospital; but, notwithstanding this, she died of capillary bronchitis, and its immediate consequences. There were all the prominent symptoms of that disease, namely clear lung resonance on percussion; frequent pulse; small crepitation in the bases of the lungs, and quickened laborious breathing and orthopnœa. The dusky features and blue lips showed imperfect aeration of the blood, and also venous congestion, which was further manifest from the pulsation observed in the veins of the neck towards the end of life. The diminished arterial tension was shown by the feeble compressible pulse, whilst at the same time the heart was acting powerfully, but ineffectually, to overcome the obstruction to the circulation. Albuminuria, a frequent consequence of obstructed circulation, also existed; small in quantity at first, the albumen increased greatly in amount as the case went on, until it exceeded one-sixth of the bulk of the urine.

The appearances found at the post-mortem examination showed that there had probably been a certain amount of obstructed circulation for some time previous to the last illness. Very probably indeed it had existed, though perhaps only in a slight degree throughout the summer of 1874. It is to this cause, and the hyperæmia which it occasioned in those organs, that I ascribe the induration of the abdominal viscera. The hypertrophy of the right ventricle of the heart was also a result of the same obstruction, leading to increased efforts of the heart to overcome it, and drive the blood through the pulmonary circulation. The extravasations of blood in the mucous membrane of the stomach and ileum, the congestion of the lungs and kidneys, and the albuminuria were all of them results of a more recent date, arising from

the increased obstruction to the circulation incident to the last fatal attack of bronchitis. The condition of the stomach, indeed, afforded a good illustration of the power of even passive hyperæmia to excite catarrh of the mucous membranes.

The plugging of the bronchial tubes with tenacious, opaque mucus found at the post-mortem examination, is not rare in bronchitis affecting the smaller tubes; but it was much more extensive in this case than is at all usual. It had not, however, been sufficient to prevent, altogether, the access of air to the deeper recesses of the lungs; for, with inconsiderable exceptions, they were distended with air; but, most unquestionably, its presence must have helped to prevent the free and constant ingress and egress of air so indispensable to the proper performance of the process of respiration.

Capillary bronchitis is, as I have already said, a very formidable disease. In the young, the aged, and the feeble it is often fatal; but it is comparatively rare in middle life, and, when it does occur, it is generally associated either with some constitutional condition, or with some chronic disease of the heart or lungs. It sometimes occurs in connection with chronic disease of the kidneys, and is common in cases of valvular disease of the heart. It also not unfrequently cuts off phthisical patients, before the chronic lung disease has seriously impaired the general health, of which we have had lately a good example under observation in Founder Ward.

CASE 11.—William B., a married man aged twenty-seven years, and a labourer by occupation, was admitted on March 9, 1877. He stated that his health had been always good, and that he had never been disabled by illness until the present attack. He had suffered more or less from cough and shortness of breath all the winter, and had also lost flesh, but had, nevertheless, been able to continue his labour until February 26, on which day he became much worse. Two



days later he had coughed up a large quantity of blood, and had continued to raise smaller quantities of blood ever since.

On admission the respirations were 48; the pulse, 132; the temperature, 101.6°. The face was of a dusky, livid hue, the lips, tongue, and fingers were cyanosed. The finger ends were markedly clubbed. The breathing was very laborious; the *alæ nasi* were working, and the epigastrium was retracted at each inspiration. The chest expanded very little with inspiration; there was impaired resonance on percussion in both supra-spinous fossæ and under both clavicles; on the right side the dulness was absolute. Over the rest of the thorax the percussion resonance was quite normal. On auscultation, large high-toned crepitation and increased vocal resonance were heard below the right clavicle, and crackling generally over the remainder of the front. The breath sounds were everywhere harsh; and crepitation, sibilus, and rhonchus were heard all over the back of the thorax. The expectoration consisted of an abundant, frothy, mucopurulent fluid. The urine was normal, and free from albumen.

Hot poultices were applied over the back of the chest; brandy was ordered, to be given at regular intervals, to the amount of four ounces in the day; and a draught containing spirit of ether, aromatic spirit of ammonia, and syrup of tolu, to be administered every four hours.

On the second day, after his admission, a trace of albumen was found in the urine. No material change took place in his condition, but he lost strength rapidly, and died rather suddenly on March 12.

At the post-mortem examination, the lungs were found to be firmly attached to the walls of the chest; and so firmly at the apex of the right lung that the organ was torn, in trying to separate it, disclosing a cavity about the size of a large walnut filled with a pinkish-coloured fluid and lined

with a thick membrane. The lung tissue for a space of three inches from the cavity was very dense and fibrous, and traversed by dilated bronchial tubes. In this condensed tissue were situated three or four other cavities, each about the size of a Barcelona nut, filled with creamy pus. All the lobes of this lung were firmly adherent to each other, and, on section, were found to be pervaded by numerous firm granulations of a greyish semi-transparent appearance. These granulations were mostly aggregated in small groups arranged in a racemose manner. There was a considerable amount of pigmentation around the granules, and generally throughout the lung. Where not occupied by these bodies the lung was crepitant, contained air, and yielded a considerable quantity of frothy fluid on being pressed. The bronchial tubes were inflamed throughout, and plugs of mucus were found even in the finest bronchioles. The surface of the upper part of the superior lobe of the left lung was puckered, and the pleura much thickened. This lobe was also traversed, though to a less extent, than the right lung, by bands of fibrous tissue. The bronchial tubes were much thickened, and the organ was pervaded throughout by granulations similar in character and arrangement to those found in the opposite organ. The bronchial tubes were inflamed, and the lung was fully inflated, as was also the right lung. No cavities were found in the left lung.

The heart was notably enlarged, but the valves were normal. Two small ulcers were found in the mucous membrane of the colon, but none on that of the small intestines.

This patient had evidently suffered from disease of the lungs at some former period, probably long antecedent to his last illness, though he had forgotten the circumstance. The marked clubbing of the fingers, the dense fibrous condition of the apices of the lungs, the firm membrane with which the larger cavity was lined, and the enlarged heart, were all

of them conditions which indicated long-standing disease; whereas the miliary granulations were obviously of comparatively recent origin, and the fatal capillary bronchitis had only, perhaps, supervened a few days before the patient came under my care. He had, however, been suffering from ordinary bronchitis all the winter, and, although not disabled from working, had been more or less of an invalid.

On the other hand, capillary bronchitis sometimes attacks persons who, although apparently in good health, have some dormant and perhaps forgotten disease of the lungs, and cuts them off after a very brief illness. As a signal illustration of this fact, I may relate the case of a gentleman who was not long since under my care.

CASE 12.—Mr. B. G., aged thirty-four years, first consulted me in June 1869. He came of a family in which there was an hereditary tendency to both gout and epilepsy. My patient had never suffered from the former of these complaints, but he had apparently had five or six attacks of *petit mal* during the preceding twelve years. When a boy of fifteen, he had suffered from a severe stitch in the left side; but, with these exceptions, his health had been good, and he had lived an active country life until the autumn and winter of 1868–69, during which he had been troubled with a cough, attended by a yellow-coloured expectoration, but in no great quantity. In the month of February 1869, he had an attack of hæmoptysis, and again a second, more considerable one, in April, at which time he raised blood enough to saturate two pocket-handkerchiefs. He had lost flesh, but was by no means emaciated; his stature was 5 feet 9 inches, and his weight 10 stone 10 lbs. He was dyspeptic, and the tongue was coated with a thick white fur. His skin was soft, and he perspired easily on exertion. The pulse was eighty-four; and, when I saw him in the forenoon, the temperature was normal. The chest expanded well and equally

on either side. The percussion resonance was slightly impaired, and there was exaggerated vocal vibration, harsh breathing, and scanty crackling in the right infra-clavicular region; faint crepitation was also heard in the right supra-spinous fossa. There was excess of resonance on percussion over the left front of the chest, extending over the præcordia, and obscuring the heart's dulness and impulse. The left side of the chest was also prominent below the nipple. The pulsations of the heart were seen in the epigastrium; the heart sounds were normal. Under a course of cod-liver oil and mineral acids, Mr. G.'s general health improved, and he gained weight; but, as in September the physical signs of disease in the apex of the right lung still remained, I recommended him to pass the winter in the South of France.

In June 1870, on his return from the South, his weight was 11 stone 7 lbs. He had only a slight morning cough, accompanied by a scanty transparent expectoration, and was free from dyspnœa. A faint click was still heard, at the end of coughing, below the right clavicle, but it was not heard in the supra-spinous region.

In the month of November the crepitation was no longer audible, and he had increased in weight; there was still slight impairment of percussion resonance, and increased vocal vibration over the apex of the right lung; but he had resumed hunting and his usual country pursuits.

He now continued well until December 1876, when he came to London for the Christmas. In walking across Hyde Park, one damp foggy evening, he took cold and began to cough. When I saw him, a couple of days later, his face was livid, his lips, nose, and fingers were cyanosed; his breathing was very laboured; his cough troublesome and abortive; sibilus was audible over the whole of both lungs, and crepitation in the right mammary region. Pulse 120; temperature 101.0°. He was, in short, suffering from a

severe attack of capillary bronchitis, which proved fatal in the course of a few days.

I have recently also seen another and more rapidly fatal case of the same kind.

A gentleman had suffered for several years from occasional cough, and there was a very limited amount of disorganisation in the apex of the left lung. He was, nevertheless, by no means an invalid, considered himself as in good health, and led an active life. A day or two after his arrival in London, he dined out and walked home, a very short distance, in one of our dense London fogs. In the middle of the night he was awakened with an attack of cough and dyspnoea, and when I saw him some hours afterwards he was obviously sinking from capillary bronchitis. His lips, tongue, and fingers were cyanosed; his breathing was very laborious and his cough frequent and abortive. Treatment was unavailing, and he died on the third day.

There was not the opportunity of making a post-mortem examination in either of these cases. I will therefore read you an abstract of a similar case, which was under my care in the hospital several years ago.

CASE 13.—Charles F., aged thirty years, a farrier by trade, was admitted into Hertford Ward on November 17, 1871. He was a well-nourished man, and stated that he had never been laid up by illness until a week before he came under my care. He had received a severe burn in childhood, which had left an extensive cicatrix upon the right side of the chest and neck. His present illness had set in with chilliness or rigors, followed by fever, cough, and shortness of breath.

On admission, his countenance was anxious; the face, hands, nails, and tongue were blue; eyes prominent; pupils dilated. The breathing was laborious and almost entirely abdominal; the expansion of the chest during inspiration

very defective. There was absolute dulness on percussion over the right infra-clavicular region, and the resonance was not perfectly good over either the upper front of the thorax generally, or the lower and posterior parts of either lung. Sibilus, rhonchus, and moist crepitation were audible over the lungs both before and behind, and rather high-toned crepitation, and tubular breathing, suggestive of the existence of a cavity, were heard below the right clavicle. There was also gurgling crepitation in the left supra-spinous fossa. The expectoration was scanty, thick, muco-purulent, and nummular. Pulse 140; respirations 52; temperature 100.0°. Urine specific gravity 1029, acid, not albuminous. The patient gradually sank, and died on the second day after his admission.

At the post-mortem examination, the right lung was found covered with greatly thickened pleura, especially at the upper part, and firmly adherent to the chest walls. On attempting to separate it from the ribs, a large rough cavity was exposed, which was separated from the chest wall only by a thin layer of condensed lung tissue, the thickened pleura, and false membrane. This cavity was lined by a false membrane that could easily be stripped off, and was traversed by a band of condensed pulmonary tissue; no communication could be discovered between it and the bronchial tubes. The fibrous stroma of the lung had everywhere undergone proliferation; but, excepting immediately around the cavity, there was a comparative absence of the induration usually found where there is considerable increase of the inter-lobular connective tissue. The lung was much pigmented, and a very distinct layer of black pigment was seen underneath the pleura. There was universal bronchitis, and the bronchial membrane was thickened.

The left lung was also attached to the chest wall at its upper part; but the adhesions were less extensive than those

of the right lung. The upper lobe presented the same increase of fibrous stroma as the right lung, and the bronchial membrane was also in a similar condition. It contained a large irregular cavity and two smaller ones, which, like the cavity in the other lung, were lined with false membrane.

You will have observed that the last of these three patients said that he had never been ill until just before his admission into the hospital. He appears to have been a sober, industrious man, and we may presume that he had, at least, had no serious illness within his recollection. We may, however, be assured, from the results of the post-mortem examination, that he must at some time have suffered from destructive lung disease. It is, perhaps, possible that this forgotten illness may have occurred in boyhood; and its nature was probably catarrhal pneumonia, from which he had made a good recovery. To all appearance, but for the accidental attack of capillary bronchitis, he might have lived for many years, for all the organs, excepting the lungs, were healthy.

I have not related the treatment employed in any one of these last cases, because they all proved so rapidly fatal, and the remedies used were of no avail in any of them. The obvious indications for treatment in similar cases are, to endeavour to relieve the pulmonary congestion, and to maintain the circulation when it begins to fail. The application of turpentine stupes over the thorax is often of much service; and, if the patient is seen at the commencement of the illness, the abstraction of from six to eight ounces of blood, by cupping over the posterior bases of the lungs, often affords great relief to the more urgent symptoms. The abstraction of blood, indeed, as was long ago pointed out by Cullen, is only useful in such cases as a means of facilitating the circulation through the lungs, and thus relieving the oppression at the chest. The pulse, previously small and

feeble, not unfrequently improves both in size and strength after this moderate withdrawal of blood. It is rarely desirable to repeat the bleeding; and, indeed, it is scarcely admissible in elderly people or in persons of broken down constitution. After the cupping, or the application of turpentine stupes, I direct the back of the thorax either to be kept constantly covered with a hot linseed poultice, or to be thoroughly enveloped in cotton wool. I abstain altogether from the employment of blisters in capillary bronchitis, although I am aware that they have been recommended on high authority. My objection to them is that they, for a time at least, increase the pulmonary irritation and aggravate the symptoms.

As regards medicines, if dry sounds predominate in the lungs, I prescribe antimony in combination with a saline sudorific, such as solution of acetate of ammonia; or, if for any reason antimony is inadmissible, small doses of ipecacuanha, given at frequent intervals. For the aggravations of dyspnœa, which are apt to supervene from time to time, I recommend the ether draught, already spoken of, to be given as may seem necessary, without intermitting the other remedies. On the other hand, when abundant moist crepitation is already audible in the lungs, I consider that the time for the abstraction of blood has passed over; and, instead of antimony or ipecacuanha, I prescribe a more stimulating expectorant, containing carbonate of ammonia in combination with tincture of squills and, if the dyspnœa be urgent, spirit of ether, to be taken at intervals of three, four, or six hours, according to the severity of the case.

When the circulation flags, we must have recourse to alcoholic stimulants, and of these brandy is undoubtedly the best and most convenient. Nevertheless, we must not forget that the use of alcohol in these cases is only designed to keep up the circulation, that it is not curative, and that it



must be employed with much circumspection. In deciding upon the administration of stimulants, I am accustomed to be guided mainly by the action and force of the heart. If the pulse becomes feeble or irregular, I prescribe brandy in moderate quantities, and direct it to be administered at stated intervals, as methodically as medicine. Beginning with a dessert-spoonful every four hours, the dose may either be increased in quantity or in frequency according to the necessity of the case; but I rarely give more than 4 ounces in the twenty-four hours. I need scarcely say that I am in this respect considerably influenced by the previous habits of the patient; allowing stimulants in larger quantity and at an earlier period to persons who have been accustomed to drink freely when in health. I feel bound, however, to tell you that I think the tendency has been to use stimulants much too freely in cases of capillary bronchitis, and that they are absolutely pernicious, unless required for the reasons I have stated. Speaking from my own observation, I am inclined to think that more harm is done in this disease by their too indiscriminate use than by abstinence from their employment in cases where they are really indicated.

## LECTURE IV.

## DRY CATARRH.

FIRST DESCRIBED BY LAENNEC—A FREQUENT CAUSE OF EMPHYSEMA—OFTEN PRESENT IN CONTINUED FEVERS—CHARACTERS OF THE SPUTUM—CHRONIC AND OFTEN INSIDIOUS COURSE—GREAT TENDENCY TO RECUR—RELATIONS WITH SEVERAL CONSTITUTIONAL CONDITIONS—PAROXYSMS OF ASTHMATICAL DYSPNŒA—ACUTE RECRUDESCENCES—CAUSES OF RECURRENCES—HÆMOPTYSIS—PREVENTIVE TREATMENT.

GENTLEMEN,—Laennec described, under the name of dry catarrh, a form of bronchitis to which I may usefully direct your attention to-day. Its study is the more important because it often leads to the development of pulmonary emphysema, and it almost invariably renders the bronchial membrane extremely susceptible and liable to a renewed attack from trivial causes. It is the form of bronchitis so frequently present in continued fevers, as we have seen exemplified in every case of typhoid fever that we have had under observation during the present autumn. In some of these cases, indeed, as I have already pointed out to you in a former clinical lecture, bronchitis has been a very prominent symptom; but in by far the greater number of cases, the bronchitis has been latent, and its presence was only detected by auscultation, which revealed sibilus or rhonchus, and more rarely crepitation, more or less extensively diffused throughout the lungs.

Dry catarrh—for I shall employ Laennec's term, notwithstanding that he himself admitted it to involve a contradiction, inasmuch as the word catarrh denotes a flux or discharge

—dry catarrh is attended, and indeed characterised, by a scanty, glutinous, semi-transparent sputum, of a grey colour, and often specked with black points from admixture with carbonaceous matter. To this sputum, which is commonly raised in the form of small masses or globules, Laennec gave the name of ‘pearly sputum,’ in order to distinguish it from the other kinds of sputum more frequently seen in bronchitis.

The disease is often chronic in its course, and may commence so insidiously and be so slight, as to exist almost unobserved by the patient himself for a considerable time—the only symptoms of which he is cognisant being a slight cough and expectoration in the early morning, and, perhaps, a little shortness of breath on ascending a hill or attempting any unwonted exertion. Once established, however, intercurrent attacks of an acute nature are easily excited by slight exposures.

Laennec said that dry catarrh is most usually an idiopathic affection, and that it is most common in gouty and hypochondriacal subjects; in persons affected with cutaneous eruptions; and in persons whose constitutions have been broken down by excesses of any kind. Indeed, so perfectly did this accurate observer describe the symptoms and course of the disease, its pathological character, and its consequences, that little more can be added to his words; though, as regards the causes and constitutional relations, and still more as regards the treatment of this form of bronchitis, I believe that we have learned much since Laennec’s time.

Although most frequent in persons who are the subjects of some constitutional derangement, yet dry catarrh sometimes occurs quite independently of the existence of any such predisposition; of which fact we have at present an example in Murray Ward.

CASE 14.—Elizabeth L., a domestic servant, aged twenty

years, was admitted on January 4, 1878. Her parents and brothers and sisters are all healthy, and there is no evidence of the existence of any tendency to hereditary or constitutional disease in her family; the patient herself had also enjoyed uninterrupted good health until about a year ago, when, after having been exposed, as a dairy-maid, to wet, to which she had not been previously accustomed, she had an attack of bronchitis, and has never since been altogether free from cough. About a week before presenting herself at the hospital, she took fresh cold; her cough became worse, and she began to suffer from shortness of breath.

On admission, her pulse was 96; respirations, 26; temperature, 98.0°. She complained of shortness of breath and of a sense of tightness and soreness in the chest, especially about the mid-sternal region; the chest expanded well, and equally on the two sides; the percussion note was quite unimpaired; dry sounds, chiefly rhonchus, were heard over the front of both lungs. Posteriorly, also, the percussion resonance was good, and dry sounds were heard over the back of the lungs both with inspiration and expiration. Heart-sounds normal; apex-beat in the normal position.

To take every six hours a draught containing 2 drachms of solution of acetate of ammonia, 10 minims of antimonial wine, 1 drachm of syrup of tolu, and 9 drachms of camphor water.

January 5.—Pulse, 92; temperature, 99.2°. Has not slept at all. Cough dry, frequent, and abortive; breathing quick and laboured; sputum, very scanty, consists of a glairy, tenacious mucus, much specked with black carbonaceous matter. Has had an attack of dyspnoea during the night, compelling her to sit up in bed.

January 6.—Pulse, 80; temperature, 99.2°; respirations, 28. Has slept well; breath-sounds improved; breathing still rather laboured. Had a paroxysm of dyspnoea about

8 P.M. last evening, which was relieved by a dose of compound ether draught.

January 7.—Pulse, 84; temperature,  $98.8^{\circ}$ ; respirations, 24. Cough still very troublesome; complains much of tightness and soreness of the chest; bowels confined; urine, specific gravity 1030, acid, not albuminous.

To take a dose of senna draught at once; and to take every four hours a draught containing 15 minims of antimonial wine, 1 drachm each of solution of acetate of ammonia and syrup of poppy, and 10 drachms of camphor water; she was also ordered to inhale the steam of boiling water every four hours.

January 8.—Pulse, 80; temperature,  $98.2^{\circ}$ ; had two attacks of dyspnoea during the night, each relieved by a dose of ether and aromatic spirit of ammonia; the first was about midnight, and the second about three o'clock in the morning; patient says that she has but little cough and no expectoration; loud snoring rhonchus is audible, with both inspiration and expiration, all over the lungs, both before and behind.

The case is a characteristic, but only a slight one, of dry catarrh; and thus far the catarrh has led to no serious consequence, beyond producing, as it probably has done, a great susceptibility for catching cold, which always assumes the form of bronchitis. The chances are, however, that other and more serious consequences may follow; for persons in the station of life of this patient can scarcely avoid exposure, which is pretty sure to bring on relapses of catarrh from time to time. The case is as yet incomplete; I shall therefore beg your attention to some other cases which have been in the hospital under my care, and which will enable me to complete the picture of this important disease.

CASE 15.—Sophia S., a charwoman by occupation, was admitted on April 28, 1874. She was unable to give any

satisfactory account of her family history ; but her own children, four in number, were all delicate, one being the subject of lung disease, another of hydrocephalus, a third of heart disease, and a fourth having enlarged cervical glands ; a fifth died of croup, a disease apt to occur in strumous families. The patient herself had been dyspeptic for many years, and very subject to attacks of pain and a feeling of fulness at the epigastrium, followed by profuse vomiting ; these attacks had latterly become more frequent. She had been laid up, about nine years before coming under my care, with bronchitis ; since which time she had been very liable to take cold, and had almost habitually suffered from cough and dyspnœa. She was a flabby woman, with a large abdomen—just the type of person likely to fall into chronic disease, and to be little amenable to treatment.

On admission, her breathing was slightly laboured, especially when lying down, and she expectorated a scanty sputum consisting of a slightly frothy, jelly-like, transparent mucus, so tenacious that the vessel in which it was held could be turned bottom upwards without displacing it ; the sputum was occasionally streaked with blood ; the whole front of the thorax was somewhat over-resonant on percussion, and this excess of resonance was most marked on the left side, where it encroached upon the normal area of cardiac dulness ; percussion over the back of the thorax also elicited unusually clear resonance, though in a less marked degree than in front ; the liver dulness was displaced, for it only began at the sixth right intercostal space, and extended slightly below the costal arch—that is to say, the liver was pushed downwards by the over-voluminous lungs ; the heart was also pushed backwards and inwards—its impulse could neither be seen nor felt in the normal position, neither was it visible in the epigastrium, as is common in cases of advanced pulmonary emphysema ; its sounds were much

masked, by reason of being imperfectly conveyed through the overlapping lung tissue, but they were in other respects quite healthy; on auscultation, the breath-sounds were audible over the whole of both lungs; the expiration was prolonged and somewhat sighing in character; dry wheezing sounds, chiefly sibilus, with occasionally rhonchus, were heard over both the back and front of the chest; here and there the vibration of these sounds extended to the walls of the thorax, and could be felt by the hand; no moist sounds, nor anything resembling them, were heard at any time during her residence in the ward; her tongue was indicative of chronic indigestion, being furred on the dorsum, flabby, and indented by the teeth; pulse, 96; temperature, 98.4°: respirations, 24; urine, sp. gr. 1018, acid, free from albumen.

At first, in consideration of her dyspeptic condition, I only prescribed the occasional use of a linctus containing half a drachm of syrup of squill and 3 minims each of solution of acetate of morphia and diluted hydrocyanic acid to relieve the cough; and for her dyspepsia, a draught containing 15 grains of bi-carbonate of soda, 1 drachm of compound tincture of cardamoms, and 10 drachms of infusion of cloves, to be taken three times a day; and placed her upon milk diet and beef-tea.

Under this treatment her stomach gained tone, her tongue cleaned, and her cough somewhat abated in frequency, but the physical signs remained unaltered. I then, about a week after her admission, ordered her a pill, containing half a grain of powdered ipecacuanha, a third of a grain of extract of stramonium, and 4 grains of extract of hemlock, to be taken every night at bedtime: and, also a draught, to be taken three times a day, consisting of 5 minims of ipecacuanha wine, 20 minims of compound tincture of camphor, half a drachm of syrup of tolu, and 11 drachms of ammoniacum mixture. A few days later, finding that the physical signs remained the

same, I added 20 minims of tincture of larch to the draught; and ordered the patient to inhale, twice a day, the vapour of hot water from an inhaler into which half a drachm of sulphuric ether had been poured.

She now greatly improved; the cough became much less troublesome, and the expectoration decreased in amount, but retained the same character—that, namely, of a transparent, gelatinous secretion, which coalesced in the basin, and adhered firmly to its bottom. The patient expressed herself as much relieved, said her breathing was much freer, and that she felt in all respects better.

This, then, was a well-marked case of Laennec's chronic dry catarrh, associated with emphysema of the lungs; but the emphysema was not far enough advanced to give rise to the distress you are accustomed to see, in most of the cases of pulmonary emphysema and bronchitis which are admitted into the hospital. Neither was the catarrh severe; for the patient had no orthopnoea, and did not suffer from the frequent abortive cough which very commonly attends this disease.

Cases of this class, although not very often found in the wards of the hospital, present themselves frequently in private practice. Patients who like this woman are subject to dyspeptic and gouty ailments, and even persons who are well nourished and to all outward appearance in good health, will often come to us complaining of morning cough, attended by a scanty expectoration, which consists either of little roundish masses of tenacious, semi-transparent, pearl-grey mucus, about the size of small shot, attached together like a bunch of grapes, or a single larger, but still comparatively small, mass of mucus specked with black. This is the expectoration denominated by Laennec 'pearly sputum,' and described by him as the secretion characteristic of dry catarrh in its usual chronic state. On enquiry you will generally find that such



persons are short-breathed, and unable to walk quickly or to ascend a hill without distress; also, that they are very liable to take cold, and to suffer from an attack of acute catarrh on every slight exposure. Many such cases come annually under my observation, and I may narrate a characteristic one which was under my care last spring.

CASE 16.—Mr. D. E., aged twenty-two years, an officer of Dragoons, a tall, broad-chested, well-nourished man, consulted me early last year for an expectoration with which he had long been troubled. He was not clear about his family history, but his father had died of dropsy. The expectoration took place, chiefly, soon after rising in the morning, but also occasionally during the day. The cough was so slight that, but for the expectoration, the patient would scarcely have noticed it. The sputum consisted of mucus similar to that described in the case of Sophia S., but was somewhat less coherent and more opaque; it was also frequently streaked with blood. He was short of breath on exertion, but in other respects considered himself as in perfect health. On exposing his chest for examination, I observed some patches of psoriasis, and ascertained on enquiry that he was subject to this form of skin affection. The skin was moist; pulse quiet; tongue furred; urine normal. The chest expanded fully in respiration and was everywhere quite normally resonant on percussion. On auscultation, sibilus with a little rhonchus was heard, here and there, over the chest; not pervading it as in the last case, but first in one situation and then in another. Now and then also, in various situations, a little dry crackling was heard. There was a faint systolic murmur at the apex of the heart.

In the first place I ordered him a draught, containing 10 minims of diluted nitro-hydrochloric acid, 8 minims of ipecacuanha wine, and 20 minims each of the tinctures of henbane and larch, with syrup of orange peel and water, to be

taken three times a day; and, a drachm of compound tincture of benzoin with half a drachm of syrup of tolu, made into an emulsion with mucilage of acacia and water, to be taken every night at bedtime. Under this treatment Mr. D. E. improved much for some time; but, although a very robust-looking man, he was so susceptible that he took cold with almost every change of weather, and needed various modifications of the treatment. In March, whilst he was to continue the tincture of benzoin draught at bedtime, I changed the day draught for one containing 3 grains of iodide of potassium, 5 grains of citrate of iron and ammonia, 1 drachm of syrup of tolu, and 25 minims of tincture of larch in  $10\frac{1}{2}$  drachms of water.

On April 25, when he took his leave of me, his cough was gone; he had little or no expectoration; the sibilus, rhonchus, and crackling sounds were no longer audible; and, according to his own account, the dyspnœa on exertion had quite disappeared; his pulse was 76, of good volume and force, and he considered himself quite well; though the cardiac murmur, of course, remained. As he went to India in the autumn he may keep well for an indefinite period, provided he adheres to a careful regimen.

You will have observed, in my history of this gentleman's case, that, when he first consulted me, he complained of a moderate degree of dyspnœa on exertion, from which he stated that he was altogether free when I last saw him. The dyspnœa was undoubtedly due to the narrowed calibre of the smaller bronchial tubes, indicated by the prevalence of sibilus now in one part of the lungs and then in another; but, the disease, though it had lasted for a considerable time in the chronic form, had never been severe, there was as yet no pulmonary emphysema; and, obviously, as the patient derived so much benefit from the treatment, the pulmonary mucous

membrane must have become healthier, and the bronchial tubes have regained their normal calibre.

I have never had the opportunity of examining, after death, the lungs of a person suffering from dry catarrh. It is not a disease that is fatal until some ulterior consequences, such as emphysema of the lungs, or disease of the heart, have resulted from protracted and repeated attacks; and, then the more immediate causes of death mask, in a greater or less degree, the slighter traces of the original ailment that may still remain; but it is certain that the narrowing of the tubes from which the dyspnoea proceeds, is caused partly by the swelling of the mucous membrane to which Laennec attributes it; partly also, I am inclined to believe, by spasm; and probably also by adhesion of the scanty, tenacious mucus to the inner walls of the tubes. This last supposition would explain the occurrence of rhonchus, and also of the dry crackling occasionally, but not constantly, heard on auscultation.

Both the cases I have related were mild examples of the disease; for even the woman Sophia S., though emphysema had commenced in her lungs, was by no means in a very suffering condition; but we had in the wards, some time since, two other, and much more severe cases of the same disease to which I must now invite your attention. The first in order, as well as in interest, was that of a young woman who occupied bed No. 16, in Murray Ward; and, whose case is the more instructive because, being a somewhat unmanageable patient, she, on at least two occasions, when almost convalescent, brought on a recurrence of her ailment, by imprudently exposing herself to cold, and thus gave us good opportunities for studying the disease in its more acute form.

CASE 17.—Charlotte C., a domestic servant, aged nineteen years, was admitted under my care on October 7, 1873. Her family history showed a decided tendency to gout and chest

disease; for her father was subject to gout, and her mother to asthma and winter cough. With regard to the word asthma I must remind you, that it is not restricted by the public, as it is by medical men, to true spasmodic asthma; but is commonly employed to indicate any form of chronic pulmonary disease attended by shortness of breath, and especially by orthopnœa. It is, however, unnecessary to determine the precise nature of the mother's so-called asthma, as it is sufficient for my present purpose to direct your attention to the fact, that there was evidence of an hereditary tendency in this woman to bronchitis and likewise to its correlative gout.

The patient herself had never been robust; the catamenia were irregular, pale-coloured, and preceded and accompanied by much pain and general discomfort. At the age of sixteen years she had suffered from a severe attack of psoriasis which had lasted for some months; and she still presented some faint patches of the eruption when she came under my care. I have so frequently pointed out to you the relation between psoriasis and gout, that I do not doubt you will at once have concluded that the psoriasis was an evidence that she had inherited her father's gouty constitution; though, at her age, she was not likely to have suffered from gouty affection of the joints.

On admission her pulse and breathing were frequent; the pulse being 136 and the respirations 50 in the minute. The temperature in the axilla was 98·6°. There was constant orthopnœa, and for several weeks the patient was obliged to sit propped up in a bedchair both by night and by day. She had a frequent, prolonged abortive cough. The sputum consisted of a transparent, tenacious mucus, small in quantity, and streaked with blood. Percussion over the thorax, both in front and behind, elicited everywhere a clear resonance, the area of cardiac dulness being obscured by the pulmonary resonance; the chest expanded fairly with inspiration, but the

breathing was jerking and irregular; the sound of expiration was distinct and prolonged, and sibilus and rhonchus were audible over the whole, both of the front and back of the lungs; the heart-sounds were clean and sharply defined. Besides great difficulty of breathing and frequent, teasing cough, the patient complained also of pain between the shoulders; and of intense headache aggravated by each act of coughing—a symptom very usual in severe dry catarrh. It frequently supervenes only during the act of coughing, the face becoming flushed, and the nose dripping at the same time. The tongue was moist, fissured, and somewhat injected; especially at the tip and border. Bowels confined; urine turbid and high-coloured, sp. gr. 1030, acid, neither albuminous nor saccharine, but depositing, as it cooled, a large quantity of red lithates.

On admission she was ordered to have a large linseed meal and mustard poultice applied over the back of the chest; to take a dose of senna draught the next morning, and a draught containing solution of acetate of ammonia and camphor water, with 10 minims each of spirit of ether and tincture of squill, every four hours. Two days later, finding that she had not benefited from this treatment, I substituted for the draught another containing 2 drachms of solution of acetate of ammonia, half a drachm of syrup of tolu, and 10 minims of antimonial wine in 1½ ounce of camphor water. I also ordered curtains to her bed, in order to protect her from the draughts of air to which she was exposed by being always propped up in bed.

You have had many opportunities of seeing the excellent effects of antimony, in the early stages of bronchitis when the expectoration is scanty. In the present instance, however, the dose at first prescribed proved insufficient, and a day or two later it was increased to half a drachm, and, as the cough continued frequent and distressing, half a drachm of syrup of poppy was substituted for the syrup of tolu.

At this time, October 11, no essential change had taken place in the physical signs; the orthopnœa continued both by night and day; the sputum retained the same characters; and dry bronchitic sounds were still audible everywhere over the chest. The pulse had, however, fallen to 84, and the respirations to 40. The temperature had remained about normal. The urine was improved; it had now a sp. gr. of 1025, was less acid, and had ceased to deposit lithates.

On October 16, the cough was much less troublesome; but the patient continued to suffer from orthopnœa, and the respirations were still 35 in the minute. The pulse was now only 72, and the temperature continued normal, as, indeed, it had been from the beginning. The sounds of respiration were almost normal over the front of the chest; but sibilus and rhonchus were still heard behind, though much less constantly and generally than on the patient's admission. The excess of resonance over the præcordia had so decreased that the area of cardiac dulness was almost normal; the increased volume of the lungs masking the heart's dulness having been due, not to true pulmonary emphysema, but, to the spurious emphysema, of which I spoke in a recent lecture; in which, by reason of the difficulty of expiration, the air-cells became over-distended, and the lungs, at the close of expiration, remained occupied by an excessive amount of residual air. This state of over-distension may eventually lead to loss of elasticity in the walls of the air-cells, and thus to true emphysema; but it often recurs many times and disappears again, in the same patient, before this result happens.

On October 18, the patient complained of headache, dyspnœa, stuffiness of chest, and pain under the left scapula; the pulse had risen to 96, and the temperature to 99·0°; there was increase of rhonchus in the base of the left lung, and some crackling friction was heard at the seat of pain;

the urine, sp. gr. 1020, was acid and not albuminous; the slight pleurisy required no modification of the treatment beyond the application of a linseed meal and mustard poultice, and soon subsided.

On October 31, the dyspnoea had entirely disappeared, there was scarcely any cough or expectoration, and the breath-sounds were everywhere fairly normal; she now took a vegetable bitter with nitro-hydrochloric acid, sat up all day, and would have been discharged if her home had not been at some distance from London.

One of the features of this form of bronchitis is great liability to catching cold, a very slight exposure sufficing to re-excite the bronchial irritation. On November 4, the day on which the patient was actually ordered for discharge, I found her so manifestly suffering from nasal catarrh that I retained her in the hospital. She had been permitted to walk out daily, and on the previous Sunday, instead of walking in the garden, she had sat down for some time, and this catarrh was the natural result of her imprudence. As yet her pulse and temperature were normal. Next day towards evening her pulmonary catarrh had returned; her cough was again very troublesome, and her breathing difficult; the pulse had risen to 108, the temperature to  $99.2^{\circ}$ , and the respirations to 40 in the minute; prolonged expiration and mixed dry sounds were again heard throughout both lungs; and the expectoration consisted of the same gelatinous, semi-transparent mucus as during the previous attack. That evening she was ordered to take the senega draught of our hospital pharmacopœia, with 10 minims of sulphuric ether, every four hours, and to have a linseed meal and mustard poultice kept constantly applied over the back of the thorax. On the following day I found her with laborious breathing, constant orthopnoea, frequent fits of abortive cough, very scanty expectoration, containing much black pigment, and

abundant sibilus and rhonchus over both the back and front of the chest; pulse, 140; respirations, 46; temperature, 98.4°.

I again prescribed the antimonial wine draught which she had taken shortly after her admission, and also another, containing spirit of ether, aromatic spirit of ammonia, and syrup of tolu, to be taken when she had severe paroxysms of dyspnœa. I also directed her to use, three times a day, an inhalation of hot water containing  $\frac{1}{2}$  a drachm of sulphuric ether, and this rarely failed to afford her great temporary relief.

For several days all her symptoms persisted, but then again began to subside, and in the beginning of December she once more became quite convalescent. Twice subsequently, she had relapses of precisely similar character just when I was about to discharge her, and on each occasion the same treatment was used with very slight modifications. One of these relapses was excited by a dense London fog. She had been quite well on the previous day, but began to experience dyspnœa and stuffiness of the chest during the fog, and went through a regular attack of her complaint, which lasted upwards of a fortnight. She was finally discharged in March quite free from dyspnœa, cough, or expectoration, and, as she went into the country, it is possible that she may have kept well for some time. I fear, however, that the improvement will be only temporary, for, with an obviously hereditary tendency to pulmonary disease, she is pretty sure to have recurrences of her ailment on every fresh exposure to cold, and eventually these will almost certainly lead to the development of pulmonary emphysema and its consequences.

The other case of dry catarrh, to which I referred, was also that of a woman.

CASE 18.—Louisa P., a widow aged 28 years, by occu-



pation a machinist, was admitted under my care on December 19, 1873. In her, as in the last patient, there was a distinct history of hereditary pulmonary disease. She stated that her father had died of bronchitis and dropsy, and her mother of asthma. She had herself had dropsy after scarlet fever, and for several years had suffered from winter cough and shortness of breath. She had not actually been laid up with her usual winter cough until about a fortnight before her admission into the hospital, when a London fog occurred, which aggravated all her symptoms and brought on extreme dyspnoea.

On admission, she had severe orthopnoea; her breathing was most laborious, though the respirations were only 28 in the minute; the pulse was 84; the temperature,  $98.2^{\circ}$ . The chest was resonant on percussion, both in front and behind; the expiration was prolonged, and sibilus and rhonchus were heard throughout both lungs; the heart-sounds were apparently normal, but were somewhat masked by the loud bronchitic sounds. The cough was troublesome, and the sputum consisted of a frothy fluid containing masses of transparent, viscid, deeply-pigmented mucus, with here and there an opaque mass of a yellowish colour; the tongue was pale, moist, and coated with a creamy fur; bowels confined; urine, sp. gr. 1015, acid, not albuminous.

I prescribed a draught containing 2 drachms of solution of acetate of ammonia, 10 minims of antimonial wine, and  $\frac{1}{2}$  a drachm of syrup of poppy, in  $9\frac{1}{2}$  drachms of water, to be taken every four hours; and also a poultice of linseed meal and mustard to be applied over the back of the chest. I also directed her to inhale the steam of boiling-water every four hours. A few days after her admission  $\frac{1}{2}$  a drachm of sulphuric ether was ordered to be inhaled together with the steam.

As in the last case, which I have related, the ether

inhalation was most beneficial, for though the orthopnoea did not cease at once, it began to diminish very sensibly from the commencement of its use. The improvement, however, as regarded the cough and physical signs, was at first very slow, and the treatment required to be repeatedly modified. At one time she took with advantage a draught containing carbonate of ammonia and infusion of senega, with 15 minims each of tincture of squill and spirit of ether; at another time, the cough being troublesome and sibilus being heard all over both lungs, she took for some nights a pill containing  $\frac{1}{3}$  of a grain each of tartarised antimony and extract of stramonium,  $\frac{1}{4}$  of a grain of hydrochlorate of morphia, and 4 grains of extract of hemlock.

Early in January, she was able to lie down at night, and her cough had become less troublesome, but sonorous rhonchus was audible throughout both lungs, and the sound of expiration continued abnormally long and audible.

I now ordered her to take, three times a day, a draught containing 3 grains of iodide of potassium, 5 grains of carbonate of ammonia, 15 minims of tincture of squill,  $\frac{1}{2}$  a drachm of syrup of poppy, and 10 drachms of camphor water. A grain of powdered ipecacuanha was substituted for the tartarised antimony in the night pill, and the ether inhalation was continued three times a day.

The improvement from this time was rapid until January 22nd, on which day there was a dense fog. Soon after it set in, the symptoms all recurred: oppressed breathing, troublesome cough, loud rhonchus throughout both lungs, and expectoration of the same character as before, deeply stained with soot, inhaled during the fog. This accession of her complaint yielded, however, after a few days, to the same remedies which had previously proved effectual, the ether inhalation being again very useful for the dyspnoea; but the attack having left her thin and feeble, she was ordered to

take a bitter tonic with nitro-hydrochloric acid and cod-liver oil.

On February 9, being nearly well, she was discharged. The resonance on percussion and the breath-sounds were then quite normal, but she still had a slight cough, with a little scanty pearly sputum in the early morning.

Elizabeth L., the patient in Murray Ward, whose case I first related to-day, has, as you will recollect, suffered from paroxysmal attacks of dyspnoea of an asthmatical character; such paroxysms are of very common occurrence in persons who are suffering from dry catarrh, and constitute a very troublesome and often unmanageable part of the disease. They closely assimilate to spasmodic asthma, differing chiefly in that the asthmatic attacks only supervene in conjunction with the bronchial affection. This, and also some other features of dry catarrh, were so well shown in a case that was under my care in the autumn and winter of 1876, that I offer no apology for reading it to you.

CASE 19.—Emma B., a housemaid, aged twenty-six, was admitted into Murray Ward on July 4, 1876. She stated that her health had been quite good until she was 21 years of age. She had then taken cold, and suffered from a severe cough, which had continued to recur from time to time. During the last year, she had at no time been entirely free from cough; it was especially troublesome at night, and she usually had a very severe paroxysm in the early morning; she also said that she had for some time suffered from a sense of tightness across the chest, and from shortness of breath. The expectoration had been small in quantity, and was sometimes streaked with blood.

On admission, pulse, 114; respirations, 30; temperature, 97.6°. The face was somewhat livid, and the lips were blue; the breathing was laborious, the subsidiary muscles being brought into action; the veins of the neck were distended,

but there was no pulsation in them. The resonance on percussion was clear over the whole of the thorax, including the præcordia; sibilus and moist crepitation were heard over the whole of both lungs; the expiration was prolonged and sibilant. The heart-sounds were masked by the loud bronchial sounds, but appeared to be normal. The cough was paroxysmal and abortive; the sputum scanty and of a gummy appearance. The dyspnœa was so intense that, immediately on admission, she was made to inhale 3 minims of nitrite of amyl, which gave her very great relief. Poultices of linseed meal and mustard were applied over the back of the thorax, and she was ordered to take every four hours a draught containing spirit of ether, aromatic spirit of ammonia, and syrup of tolu, and to inhale a drachm of spirit of ether with the steam of hot water whenever the breathing became oppressed. She was also ordered 4 ounces of brandy daily.

On the following day the face was much less livid, the pulse much stronger, and the dyspnœa greatly relieved, but the cough continued troublesome. The urine was normal, but of rather low specific gravity. I then prescribed antimonial wine, in 10-minim doses, with solution of acetate of ammonia and syrup of poppy, to be taken every four hours, and directed the ether inhalations and hot poultices to be continued. The allowance of brandy being no longer required was at once cut down by one half, and entirely discontinued after a few days.

Under this treatment she improved very much; the constant orthopnœa disappeared, the cough became less troublesome, the sputum increased in quantity, became less glutinous, and consisted of opaque, grey masses floating in a watery fluid. She complained of splitting head-ache, especially at the time of coughing; the bowels were confined, and the tongue furred; she still continued to suffer from

paroxysmal attacks of asthmatic dyspnœa in the middle of the night or early morning, but they were less severe than at first. She was ordered an occasional aperient, and the other treatment was modified as circumstances seemed to render expedient.

On July 31, she was quite free from cough and shortness of breath, but the breath-sounds were a little harsh, and occasional wheezing was heard on auscultation. She was discharged on the following day, at her own desire, but very soon took cold, and returned to our care. The symptoms on her re-admission were similar to those which she had presented at first, but much more urgent. There was constant orthopnœa, frequent abortive cough, pallid face, and livid lips. Loud sibilus was audible all over the whole of both lungs; the temperature was slightly raised, being  $99.8^{\circ}$ ; pulse, 114.

The inhalation of nitrite of amyl was again of great service in relieving the dyspnœa, though it failed to prevent the asthmatic paroxysms which supervened every night.

I need not detail either the daily progress of the case, or the varied treatment which she underwent. She continued to have attacks of asthmatical orthopnœa almost daily in the early morning, which were sometimes relieved by nitre fumes; sometimes by smoking a stramonium cigarette; at other times by inhaling nitrite of amyl or ether. None of these remedies were uniformly successful, but each in turn appeared to answer for a time. Meanwhile the cough continued, and sibilus, and more or less scanty crepitation in the posterior bases of the lungs, were always heard on auscultation. She took cold most readily, and had whilst in the hospital repeated recurrences of a more acute character.

I found her still an inmate of the ward on returning from my autumn holiday, at the end of September. She now had an asthmatical paroxysm about 5 o'clock every morning, and

dry and moist sounds were audible in the lungs, varying however in situation and intensity from time to time; the sputum was thick, transparent, and glutinous. She frequently had attacks of orthopnœa, preventing her from lying down for several days together; but, even at such times, the asthmatical paroxysms recurred each morning about the usual hour.

I now ordered an emetic, consisting of 20 grains of powder of ipecacuanha and 1 grain of tartarised antimony in syrup and water, to be given whenever the orthopnœa continued throughout the day. This was attended by the most favourable result, for it not only relieved the orthopnœa but also prevented any return of the nocturnal asthmatic paroxysms for several subsequent days.

On November 9 she had a more than usually severe attack of acute catarrh; the pulse rose to 136, the temperature to  $101.8^{\circ}$ , the respirations to 28. The dyspnœa was very severe, and was relieved by a draught containing 2 minims of nitrite of amyl, 2 drachms of syrup of tolu, and 10 drachms of water; but the relief was of short duration, and it was necessary to repeat the dose once or oftener daily. Ether and expectorants of various kinds were also administered, but the greatest benefit was derived from the emetic which had been so useful before. After taking an emetic on alternate evenings for ten days, she remained free both from orthopnœa during the daytime and also from the nightly attacks of asthma for more than a fortnight; then, again, she had a recurrence of her complaint after exposure to a London fog. On recovering from this attack she was discharged fairly well, was sent into the country, and has not since returned to us.

Dry catarrh is peculiarly liable to recur at frequent intervals and from slight causes, as was well shown by the cases of Charlotte C. and Emma B. In such cases the bron-

chial membrane is in a most irritable state, and very slight causes suffice to excite an attack. A fit of indigestion; exposure to damp, to cold winds, or to any other cause of chill to the surface of the body; breathing the dry atmosphere of an over-heated apartment; the inhalation of smoke, especially in the form of London fog, or of air containing any gaseous impurity, may any of them suffice to excite an attack, more especially if the patient be at the time in an enfeebled state. When an attack is once excited, it not only leaves a greater liability to subsequent attacks, but it is apt to be prolonged and renewed from time to time by recurrences arising from trivial causes.

Sometimes the bronchial congestion present in dry catarrh is relieved by hæmoptysis. Small quantities of blood are not unfrequently raised with the sputum; in most cases the blood is not mixed with the sputum, but appears in the form of streaks or drops, the portions of sputum untinged by it presenting their ordinary appearance. In rare cases the hæmorrhage is more copious, and may even amount to an ounce or more at a time, often to the great and manifest relief of the patient. This may occur where there is no consolidation of the lungs, nor any reason to believe in the existence of tubercle. Two patients seen by me more than twenty years ago are still alive, and I believe in good health; each of whom had very copious hæmoptysis without there being reason to believe in the existence of any organic disease either of the lungs or heart. In both of these patients the catarrh was manifestly excited by inhaling the atmosphere of rooms heated by the use of gas, without the provision of any method for carrying off the products of combustion; and, although for a time both patients appeared to be in a critical state, they both recovered rapidly so soon as the relation between the hæmoptysis and its cause was discovered, and have remained well until the present moment.

In some cases the disease, after a time, ceases to deserve the name of dry catarrh ; moist sounds become developed in the bronchial tubes, the expectoration becomes more abundant and less tenacious, and the asthmatic symptoms pass away. The more nearly, in such cases, the sputum assumes the characters of *sputum coctum*, the more complete is the relief experienced by the patient, and the better the prospect of that relief being permanent.

Persons who have once suffered from dry catarrh require to guard most carefully, by suitable warm clothing and the avoidance of undue exposure, against chilling of the surface of the body. It is also essentially necessary to live carefully on simple, nutritious, and digestible food ; since whatever causes indigestion is likely to excite the pulmonary trouble. All excess in the use of alcoholic stimulants should also be most carefully avoided ; indeed, whenever it is possible—and it is so in most cases—I advise persons who are subject to dry catarrh to abstain altogether from the habitual use of stimulants, although sometimes during an attack we must have recourse to them on medical grounds, and often with obvious benefit.

Whenever circumstances will allow, the place of residence should be selected with a view to suiting the patient. For this selection, however, there is no fixed and invariable rule ; for whilst the greater number of such patients find their ailment aggravated at the sea-side, there are some few who are better there than elsewhere. I have even known some invalids of this class who enjoyed almost complete immunity from the attacks whilst residing upon the bleak east coast, as at Margate for example ; more commonly, however, a mild, dry, pure country air suits such patients. Sometimes an elevated situation is found best ; other patients, again, are better in low-lying districts ; and, in a few cases, residence in a narrow valley has afforded the greatest degree



of immunity from the recurrence of the disease. In every case, however, the employment of such hygienic means as are calculated to invigorate the general health and to enable the patient to resist the changes of season and weather, will constitute a most important part of the treatment.

## LECTURE V.

## CHRONIC BRONCHITIS.

CHRONIC SOMETIMES A SEQUEL OF ACUTE BRONCHITIS—BRONCHITIS FROM EXPOSURE TO COLD—BRONCHITIS FROM MECHANICAL IRRITATION—PULMONARY CONSOLIDATION A COMMON SEQUEL OF BRONCHITIS FROM MECHANICAL IRRITATION; SLOW AND INSIDIOUS COURSE OF DISEASE; MORE FREQUENT FROM INHALATION OF GRIT; BRONCHITIS FROM INHALATION OF LIGHT DUST OFTEN UNCOMPLICATED—BRONCHITIS FROM INHALATION OF HOT AND OVER DRIED AIR OR NOXIOUS VAPOURS—REMARKS ON TREATMENT.

GENTLEMEN,—Chronic bronchitis, the third variety of bronchitis to which I said in my second lecture I should beg your attention, sometimes occurs as a sequel of the acute form of the disease. The bronchial membrane does not entirely regain its pristine state after the acute symptoms have subsided, and the patient continues to suffer for an indefinite period from cough and expectoration, with or without dyspnoea, according to the extent to which the process of respiration is interfered with. At first the symptoms usually abate with the arrival of warmer weather, but they are usually lighted up afresh during the colder part of the year, again probably to disappear with the return of summer. These alternations of bronchitic attacks, with periods of almost complete immunity, may go on for many years, until at length the often renewed irritation leads to permanent changes in the bronchial membrane or tubes, and the summer remissions become less and less complete and of shorter duration; so that finally the patient is scarcely ever free from his ailment, and becomes gradually disabled from

all active employment. This form of bronchitis is sometimes called 'winter cough' by the public; and, as it rarely becomes dangerous to life until after the development of some organic alteration—such as thickening of the bronchial tubes, or pulmonary emphysema—a single case will serve as an illustration.

CASE 20.—William F., aged thirty-five, by occupation a cabinet-maker, was admitted an out-patient, under my care, on October 20, 1865. At the age of ten years he fell into a pond in winter, which had brought on a severe cold, since which time he had always been subject to cough, from which, indeed, he was never entirely free. This chronic cough was at any time easily aggravated by exposure to wet or inclement weather, and he was always more or less completely laid up with it every winter. There was no family tendency either to pulmonary disease, or to any form of constitutional disease, and he had never himself suffered either from gout or rheumatism, nor, indeed, from any other ailment excepting bronchitis.

On admission he complained much of dyspnoea, and had frequent cough, attended by the expectoration of a thin, transparent, frothy mucus. His skin was cool; pulse, 74. The chest was well formed, and rose evenly and equally on both sides during inspiration, but the breathing was laborious, the sterno-cleido-mastoid and scalene muscles acting powerfully as elevators of the chest during inspiration, the supra-clavicular regions being at the same time depressed so as to form deep cavities behind the clavicles. But although the breathing was thus difficult, it was not proportionably accelerated, there being only 24 respirations in a minute.

These symptoms, I may observe, are all characteristic of bronchitis. Both in pneumonia and in progressive phthisis, as I have repeatedly pointed out to you, the skin is pungently hot; whereas, even in the febrile stage of acute bronchitis,

when uncomplicated either with pneumonia or tubercle, although the temperature of the body may be raised, the skin seldom conveys to the hand any remarkable sensation of heat, and in chronic cases, such as the one now under consideration, frequently does not exceed the natural warmth. The pulse also, in chronic bronchitis, very often does not exceed the normal frequency. Again, though the respiration is often quicker in the other pulmonary diseases I have named than in bronchitis, yet it is never so laborious. Even with greatly accelerated respiration, patients suffering from pneumonia are often not conscious of dyspnoea; whereas in severe bronchitis laborious respiration is the rule.

With reference to the nature of the expectoration, I should remind you that the thin, transparent, frothy expectoration which our patient was raising when he first presented himself is indicative not of chronic but of recent bronchitis; or, as in his case, of a recent accession of the disease engrafted upon an old chronic affection.

In order to complete the history of this case, there are two other points to which I must briefly allude. The front of the chest was over-resonant on percussion from apex to base on both sides, distinct pulmonary resonance being elicited by percussion even over the præcordia; the percussion resonance was also quite clear and normal over the back of the thorax; the respiration was feebly heard over the left mammary region: in other situations it was sometimes harsh, and it was everywhere more or less sibilant; the heart was seen beating immediately below the xiphoid cartilage, where also its sounds were most distinctly heard: they were feeble, but free from murmur.

This displacement of the heart downwards and towards the right, so that its impulse was only seen in the epigastrium, was unquestionably due to pulmonary emphysema, the existence of which was shown by the abnormal clearness

of the percussion resonance over the whole front of the chest.

As regards the treatment and progress of this patient, I may briefly sum them up by saying that he derived much benefit from the use of a draught containing tincture of squill and solution of acetate of ammonia in combination with tincture of henbane and spirit of chloroform; and that, as soon as the more urgent symptoms had abated, I substituted for this a draught containing tincture of gentian and diluted nitro-hydrochloric acid, with 20 minims each of the tinctures of larch and henbane. Under this treatment he improved very greatly in all respects, and soon passed out of observation.

This case belongs to a class in which great benefit may be derived from medical treatment during the exacerbations of the chronic bronchial affection, and in which much may be done by care and proper management to retard the progress of this latter; but in which, also, the disease itself had been too long and too firmly established to give us much hope of being able to effect a permanent cure, especially in a person necessarily liable to undue exposure. The case was one of what may be termed simple primary bronchitis, arising from a definite exposure to cold and wet, in a healthy subject free from any constitutional tendency, and leaving a life-long delicacy of the bronchial membrane. Such cases form a very small proportion of the cases of chronic bronchitis, of which we see so many both in the wards and the out-patient room of the hospital, the greater number of which, as I shall explain in my next lecture, occur in persons who have either inherited or acquired a special predisposition for the disease.

Another cause of primary chronic bronchitis is the inhalation of irritants into the lungs, either in the form of fine dust or of vapour. Cases of this kind are less frequent in

London than in some of the mining and manufacturing districts, though even here we meet with a notable sprinkling of them. Here, again, I shall avail myself of my former out-patient practice for examples in illustration of my subject. Whilst assistant physician I used to see a multitude of cases of pulmonary disease, and found amongst them a much larger number of cases of the class now under consideration than I have since met with in the wards of the hospital. I select the first example on account of the marked absence of any constitutional predisposition, either in the patient himself or in his family.

CASE 21.—Thomas L., aged fifty-two, a stone-mason by occupation, was admitted an out-patient, under my care, in December 1866. The family history was satisfactory, his parents having both lived to an advanced age, and neither of them having suffered from any form of dyscrasia or of pulmonary disease. The patient himself had never been affected with either gout or rheumatism, and had, in his own opinion, been a healthy man until within a year of the time of his admission. I found, however, that for many years he had been accustomed to raise a little thick, dark-coloured mucus early in the morning, and had lately become prone to slight catarrhal attacks attended by cough. His occupation had mainly consisted in hewing various kinds of stone, during which process a great deal of grit and dust was thrown off. He had been laid up in the preceding spring for a month with a more than usually severe catarrhal attack, and from that time had had a constant expectoration of thick, yellow-coloured mucus, and had suffered more or less from dyspnoea, especially on moving about. He had never had hæmoptysis, nor even seen a streak of blood in his expectoration.

On admission, his skin was cool; pulse only 72, small and compressible, tongue clean; bowels regular; the cough and dyspnoea were both troublesome, and the expectoration

was thin, yellow-coloured, and copious; in front the chest was quite normally resonant on percussion, from apex to base on the right side, and to the fourth rib on the left side, below which it was dull; the heart's apex was seen and felt beating in its normal position, but the impulse was more diffused than in health, and a faint systolic murmur was audible at the left apex; there was also deficiency of resonance over the posterior base of the left lung, from the angle of the scapula downwards; sibilus and rhonchus were audible over the upper parts of both lungs and in the base of the right lung, but very little air entered the base of the left lung; no moist nor crepitating sounds were heard in any part of the chest.

This was a quite characteristic, though not very far advanced, case of chronic bronchitis, arising from long-continued mechanical irritation of the bronchial membrane, produced by the inhalation of grit. There had been for years, as is usual in such cases, a chronic bronchial affection of by no means a severe character, but which had gradually rendered the membrane more and more delicate, and more prone to the invasion of active disease from any slight exciting cause. This had not disabled the man from following his ordinary occupation, and had not, therefore, been regarded by himself as of any consequence until a sudden aggravation of the symptoms had laid him entirely up for a time. This later stage of the disease, in which the patients are often temporarily disabled from work, sometimes comes on very gradually without any additional exciting cause; but it is much more frequently accelerated, as it seems to have been in this instance, by an attack of catarrh.

In this case I must draw your attention, lastly, to the circumstance that there was pneumonic consolidation of the lower lobe of the left lung, denoted by the deficiency of resonance and by the absence of the bronchitic sounds in

that region. This must have taken place, at latest, during the patient's illness in the previous spring, which had doubtless been an attack of broncho-pneumonia, for when he came under my care there was no active pneumonic disease going on, and although the cough and expectoration greatly diminished, and the patient improved much in general health whilst under treatment, the dulness on percussion underwent no material change.

This tendency to remain for an indefinite time in a quiescent state is peculiar to the consolidation of lungs consequent on disease excited by mechanical irritation. The progress of such cases is exceedingly slow; the patient becomes gradually and unconsciously accustomed to the diminished capacity of the lungs for the purpose of respiration, to which he accommodates his habits; but, nevertheless, he is frequently able to continue at work until the lungs have become very extensively diseased. This kind of disease is produced by the inhalation of various kinds of dust, and is identical with the diseases known, in their respective localities, as grinder's rot, miner's asthma, and potter's phthisis.

The dulness on percussion over the lower lobe of the left lung in our patient showed that the case was no longer one of simple bronchitis, but that the parenchyma of the lung had likewise become diseased. Observation has, however, satisfied me that in these cases the disease always commences as bronchitis; though, either insidiously, from the permeation of mechanical particles into the tissue of the lungs, or else more suddenly, as the result of catarrhal inflammation, the lung tissue does often eventually become diseased and consolidated.

Persons in these circumstances frequently suffer, for many years, only from chronic cough and expectoration, until at length the occurrence of some catarrhal attack, to which the condition of the bronchial membrane renders them very liable, suddenly disables them entirely from work.



I have usually found that such patients, when driven at length to seek medical aid, date the first commencement of their illness from the recent catarrhal attack, which has in reality only aggravated their condition, ignoring altogether the previous cough, expectoration, and shortness of breath to which they had gradually become inured during the slow development of their disease.

I had under my care in the hospital, some years ago, a patient whose case so fully exemplifies what I have explained to you, respecting the commencement of this form of pulmonary disease in chronic bronchitis, that I shall quote it in illustration of my remarks.

CASE 22.—Thomas R., aged thirty-eight, a tool-grinder from Wolverhampton, became an out-patient at the Middlesex Hospital, under my care, on May 19, 1863. He had worked as a grinder, from boyhood, exclusively upon a wet stone, but had inhaled air loaded with fine stone grit, whenever he needed to prepare his grind-stone: a process which is performed whilst the stone is dry. He had suffered for many years from shortness of breath; but from cough and expectoration only during the last three years, during which time the difficulty of breathing had also much increased. He stated himself to be of temperate habits.

On admission, the patient showed no emaciation; his skin was cool, pulse quiet, and urine normal. His chest was somewhat flat in front, but expanded equally on both sides. The percussion resonance was normal over the whole chest, both in front and behind. The respiration was slightly laborious. The breath-sounds were harsh, more particularly in the right lung; and bronchitic cooing sounds were heard in the posterior and lower parts of both lungs. The heart was in its normal position, and its action and sounds were healthy. The expectoration was white, semi-transparent, and tenacious.

Early in June he had an attack of pleuro-pneumonia in the right lung, for which he was admitted into the wards. His illness whilst he was in the hospital presented no unusual features; but, as the pneumonia subsided, the expectoration assumed the frothy appearance characteristic of acute bronchitis, and was found, on microscopical examination, to contain small fragments of lung tissue.

On July 4, when he returned to the out-patient room, he was thinner than when he first presented himself, but still by no means emaciated. His skin was cool, and his pulse only 80. He had frequent short cough with bronchitic expectoration. There was now slight dulness on percussion in both infra-clavicular regions, which was somewhat more marked on the right side. There was also diminished expansion of the upper part of the thorax on both sides. The respiration was harsh over the left lung, the lower lobe of which was imperfectly permeated by air. In the right sub-clavicular region the respiration was tubular, and scanty crepitation was heard. The respiration was harsh over the remainder of the right lung, which was well permeated by air.

He was ordered a draught containing nitro-hydrochloric acid and compound tincture of gentian, with 20 minims each of the tinctures of larch and henbane, to be taken, together with a teaspoonful of cod-liver oil, three times a day. I also directed the back of the thorax, on the left side, from the spine of the scapula downwards, to be painted with solution of iodine twice daily.

On July 11 he was progressing favourably. His cough was less troublesome, and the expectoration had greatly diminished. Air penetrated the lower lobe of the left lung more freely. Expiration was prolonged in the upper lobes of both lungs. Loud sonorous rhonchus was audible in the left infra-clavicular region; the crepitation below the right

clavicle was now only heard during cough or forced inspiration.

On July 30 he still had much shortness of breath and occasional cough, attended by a scanty, opaque expectoration. The dulness on percussion and diminished expansion of the thorax remained unaltered. The respiration continued harsh in both lungs; no moist sounds were now audible, the crepitation in the apex of the right lung having entirely ceased.

Considering himself convalescent, the man returned to Wolverhampton early in August, with the intention of resuming his occupation.

Before making any comment upon this case I will relate that of a young man who was under my observation as an out-patient for upwards of three years. His disease was of the same nature, and arose from the same cause as that of Thomas R.

CASE 23.—Edward W., aged twenty, tool-maker, became an out-patient at the Middlesex Hospital, under my care, on September 15, 1865. His family were all healthy. He had worked at tool-making for eleven years, and had been exposed to the inhalation of dust, consisting of minute particles of steel and grit, in several of the processes in which he was engaged. He had been suffering from cough and dyspnoea for several months.

At the time of admission his shoulders were rounded, and his chest was rather flat below the clavicles. The right side of the thorax expanded more fully than the left, in deep inspiration. The percussion resonance was quite clear below both clavicles, and over the whole front of the thorax: it was also clear over the posterior aspect of the chest. The apex-beat of the heart was felt below the nipple; the heart-sounds were normal. The breath-sounds were harsh, and the expiration was prolonged over the front of the thorax. Moist

crepitation was audible in the posterior base of the left lung, but in the base of the right lung the respiration was dry and sonorous. The expectoration was thick, opaque, and of a yellowish colour. Pulse, 73, of good volume; respirations, 28; skin cool; tongue clean. The patient said that he had lost flesh, and perspired easily. His weight was 7 stone 11 lbs.

He was ordered a draught, containing tincture of gentian and nitro-hydrochloric acid, with 10 minims of wine of ipecacuanha, and 20 minims of tincture of henbane, to be taken three times a day, together with 1 drachm of cod-liver oil.

On October 13 his cough was still troublesome, but the expectoration had become more scanty. Pulse, 76. The dose of cod-liver oil was increased to 2 drachms.

Four weeks later he said that he had little cough, except in the morning after first rising. The expectoration was of the same character as before, but much diminished in quantity. His skin was cool; pulse 72, of good volume; respirations, 25. The percussion resonance remained clear. The respiration was harsh and dry; there were no longer any moist sounds. His weight had increased to 8 stone 4 lbs. The same treatment was continued.

By December 29 there was marked improvement; he had scarcely any cough, except in the early morning; and no expectoration, besides a little thin, light-coloured mucus. He said that he was able to work again as well as ever, but that he had for some time avoided working in dust. His weight was now 8 stone 6 lbs.

On February 28, 1866, he complained much of difficulty of breathing, especially on going upstairs, although he had but little cough and expectoration. There was now slight deficiency of resonance in the infra-clavicular regions. The sound of expiration was much prolonged over both the front and back of the lungs. The skin was cool; pulse, 72.

A year later, January 4, 1867, there was evident flattening of the chest below both clavicles, more particularly the left; and the left side of the chest expanded less freely than the right. The percussion resonance was somewhat deficient on both sides. The respiration was harsh, and the expiration prolonged over both lungs. There were no moist sounds. His cough was not very troublesome, and the expectoration was scanty; but he had much shortness of breath on exertion. He weighed 8 stone 2 lbs. He was ordered a drachm of syrup of iodide of iron with 2 drachms of cod-liver oil three times a day, and 5 grains of compound pill of hemlock at bed-time.

On February 22 he said that he had taken cold, and his skin was rather warm. Rhonchus was audible in the base of the left lung, and also scanty crepitation after coughing. A draught containing infusion of senega, carbonate of ammonia, and tincture of squill was now given with the hemlock pill.

On May 3, dulness on percussion was evident in both supra-spinous fossæ. There was increased impairment of resonance below both clavicles; the respiration was everywhere harsh and somewhat tubular; and slight crepitation was heard in the apices of both lungs on forcible breathing. His weight was only 7 stone 7 lbs.. He had then for some time resumed the syrup of iodide of iron and the cod-liver oil.

On June 15 his cough was more troublesome, and he stated that he had had an attack of hæmoptysis during the previous week. Crepitation was audible at the left nipple, and there was intensified vocal vibration all over the chest. His pulse was 100, and he had increasing difficulty of breathing on exertion.

On November 26, 1867, until which day he had continued to work at his employment, he had another attack of hæmoptysis. The physical signs had undergone little

change, but the dulness on percussion had somewhat extended, and the crepitation in the apex of the left lung had acquired a high-pitched metallic tone. His skin was cool, and the pulse only 80. He had lost flesh since May.

The last note I find recorded of this patient's condition is dated September 25, 1868. He was then much emaciated; the skin was hot; pulse, 100; respirations, 38. The muscles of the neck were in powerful action to assist respiration. The chest was shrunken and flattened below the nipples as well as below the clavicles, and expanded very little in inspiration. The apex of the heart was felt beating in the normal position. There was dulness on percussion below both clavicles and in both supra-spinous fossæ. The breathing was harsh throughout both lungs, and crepitation was heard in the upper lobes; in the left apex it had a metallic tone.

We were thus able to watch the steps by which this patient's disease advanced. If, when he first came under my care, he had discontinued his employment, and sought for some out-door occupation, as I recommended him to do, he might possibly have recovered, or his life might, at least, have been indefinitely prolonged. Under the continued irritation, caused by the inhalation of dust evolved during his work, the disease made slow and steady progress, until at length it became so extensive that recovery had manifestly become impossible when I last saw him.

Both these last cases were characteristic examples of the form of disease we are now considering. Starting, as I have said, from the mechanical irritation of the bronchial surface produced by the gritty particles inhaled into the lungs, it presents in its earlier stages only the symptoms and signs of chronic bronchitis. At a later period it exhibits also those of consolidation of the lungs. In a still more advanced stage the physical signs are those of phthisis; and, in fact,

this disease must, in its final stage, be regarded as a form of phthisis. It may be distinguished from other kinds of phthisis by its slow chronic course, and also by the comparatively slight amount of constitutional disturbance attending it, which bears no proportion to the intensity of the physical signs. There is seldom any appreciable emaciation until the later stages of the disease; and in all the cases I have seen, except during the intercurrent attacks of acuter disease, or in the very last stage, the skin has been cool and the pulse quiet.

I have observed that, in cases of this kind, consolidation of the lungs is most apt to supervene when the patients are liable to inhale grit or any of the heavier kinds of dust; whilst in those persons whose occupation exposes them only to the lighter kinds, the bronchitis that ensues more frequently remains uncomplicated.

From this I infer that the different course of the disease, in the two classes of cases, is probably due to the fact of the lighter kinds of dust being expelled again with the expectoration secreted by the irritated bronchial membrane; whereas much of the heavier, and often sharply angular dust, in place of being expelled, gradually makes its way through the bronchial walls into the pulmonary tissue; setting up irritation and its consequences there as surely as in the bronchial membrane itself. I have examined several specimens of grinder's, stonemason's, and miner's lungs, in which gritty particles were seen, under the microscope, embedded in the consolidated tissue. On chemical examination, these have proved to be particles of silica, some of which were in a crystalline state and polarised light.

I will now give you one or two cases of bronchitis excited by the inhalation of the lighter kinds of dust, in which, as you will hear, the complaint was much more tractable, and more completely relieved by the discontinuance of the un-

healthy occupation than in the cases which we have hitherto been studying.

Many years ago, when physician to the Western General Dispensary, I became acquainted with the fact that a large proportion of the chaff-cutters of London suffer, and ultimately die, from bronchitis and its consequences. I had at that time the opportunity of making two post-mortem examinations of patients who had died of bronchitis, arising from this cause, and I found their lungs voluminous, emphysematous, and without any signs of consolidation. In a third case, that of a man who had been under my care for three years, during which period he had two attacks of pleuro-pneumonia, the posterior parts of the lungs were found to be the seat of iron-grey consolidation. Since I became attached to this hospital, I have seen comparatively few cases of chaff-cutters' bronchitis; but I will give you the notes of one which is sufficiently characteristic.

CASE 24.—Richard M., aged forty-seven, chaff-cutter, became an out-patient at the Middlesex Hospital, under my care, on April 24, 1863. His business consisted in going round to the stables of his customers to cut chaff for their horses, and the air he breathed whilst at work was loaded with dust given off during the process of cutting. He stated that he had followed this occupation for ten years, and had usually worked eight hours a day. He had long suffered habitually from cough and tightness of chest, and latterly also from difficulty of breathing.

At the time of admission his skin was cool and pulse quiet. The expectoration was scanty, opaque, and of a yellow colour. The chest was normally resonant on percussion, both over the anterior and scapular regions; but there was a slight degree of dulness over the posterior bases of both lungs. The breath-sounds were feeble in the apex of the right lung, harsh in the apex of the left. The respira-



tion was tubular near the right nipple, and coarse crepitation was heard over a limited space near the left nipple. There was fine crepitation in the base of the right lung, and large mucous crepitation in the corresponding part of the left lung. Urine normal. He was ordered to take a draught containing infusion of senega, carbonate of ammonia, tincture of squill, and ipecacuanha wine, and was further advised to discontinue his occupation, at least for a time.

A fortnight later he was found to be improving, and was then ordered to take, three times a day, a drachm of cod-liver oil with a draught composed of compound tincture of gentian, nitro-hydrochloric acid, ipecacuanha wine, and compound tincture of camphor.

On May 22, he had been quite free from exposure to chaff-dust for a month, having left his work since the day he was first seen. His aspect was much improved, and the cough and dyspnoea had greatly decreased. The moist sounds in the base of the left lung had given place to harsh, dry respiration, the crepitation near the left nipple had disappeared, and the fine crepitation in the base of the right lung had become coarser and less extensive.

He continued to improve until near the end of June, when, considering himself convalescent, he ceased his attendance at the hospital, and resumed his work.

I had under my care, at the same time, a patient who remained under observation for a much longer period, and the history of whose case is conclusive as to the cause of his complaint and the effectual remedy for it.

CASE 25.—Thomas T., aged twenty-two years, a machine-tenter, was admitted under my care, as an out-patient, on June 12, 1863. His work consisted in attending machines through which cotton, wool, and feathers were passed for the purpose of being teased and cleansed, previous to being made up into mattresses and feather beds; the several materials

were rapidly whirled and shaken about during the process ; and, although the machines were closely covered, much dust of a light kind, and many fibrous particles, escaped into the air of the workshop. He had only followed this employment for two years. He had previously been quite healthy ; but during the last two years had frequently suffered from bronchial catarrh. For several months before his admission he had been much troubled by difficulty of breathing and by cough, attended by an opaque muco-purulent expectoration, which had, of late, been frequently streaked with blood.

On admission he had an inflamed sore throat, and a husky voice. His chest was well-formed and normally resonant on percussion over its whole anterior aspect ; the resonance was also clear over the back. The breath-sounds were dry and sibilant in front ; loud rhonchus was audible behind, in the lower lobes of both lungs. No moist sounds were anywhere heard.

He was put under nearly the same medical treatment as the chaff-cutter ; and was advised, if possible, to change his occupation, which in the meantime he agreed to discontinue.

On June 26, the cough and expectoration had decreased. Rhonchus was nevertheless still audible between the scapulæ and in the lower lobes of both lungs. The respiration over the front of the chest was, also, still dry and sibilant ; expiration prolonged.

By July 10, the rhonchus in the back of the lungs had much diminished. The patient then went to the Convalescent Institution at Walton-on-Thames ; and, on his return, reported himself as quite well, and resumed his work, which he persevered in for several weeks.

On September 11, he was re-admitted, suffering much with cough, shortness of breath, and wheezing, especially at night. The expectoration was more copious than before, thin and frothy. He said that his present attack had come

on gradually, the first symptoms having been pain and oppression in the sternal region, which had appeared almost as soon as he recommenced work. There had been no hæmoptysis. His chest continued normally resonant on percussion; the respiration was harsh and sibilant as before. The necessity of abandoning his present occupation, if he desired to enjoy good health, was again impressed upon him.

On September 25, he informed me that he had been transferred to another department of the factory, and there was already a manifest improvement in his condition; the cough and expectoration having much abated. He was discharged well early in November, and I have had the opportunity of ascertaining that he has since continued in good health.

I shall read you the notes of one more case of chronic bronchitis arising from the cause we are now considering. The patient was engaged in a branch of industry which had not attracted notice as a cause of bronchial irritation until I drew attention to it, some years ago, in the pages of the 'Medical Gazette.'

CASE 26.—John L., aged thirty-one years, paper-stainer, was admitted an out-patient at the Middlesex Hospital, under my care, on August 7, 1864. His work consisted chiefly in applying bronze powder to wall-papers, during which process the air he breathed became charged with fine bronze dust. He said that all the men employed in the same manner were liable to chronic cough, and that he had himself, for the last five years, had almost constant cough, attended by a copious, thick, white expectoration, but not, until latterly, by much difficulty of breathing.

At the time of admission his voice was hoarse; skin cool; pulse, 76. His chest was well-formed, expanded properly in respiration, and was normally resonant on percussion on both sides. The breath-sounds were harsh, dry, and sibilant,

throughout the upper lobes of both lungs. He was ordered the draught I had found useful in similar cases, containing nitro-hydrochloric acid, tincture of gentian, ipecacuanha wine, and tincture of henbane.

On August 21 he had much less cough, but the expectoration continuing copious I added 20 minims of tincture of larch to his draught; and, his more urgent symptoms being soon relieved, he discontinued his attendance after September 4.

He presented himself again at the hospital on October 2, complaining of a fresh accession of cough, expectoration, and dyspnoea. The physical signs, and the sounds of respiration, were much the same as at his first admission. He was ordered to resume the draught with the tincture of larch, and was strongly urged to endeavour to change his occupation.

On October 23, he was again much better; the cough and dyspnoea were less troublesome, and the expectoration much diminished in quantity.

From that time, having been removed to another branch of work, he continued to recover steadily, and, on December 15, said that he was quite free from cough, expectoration, and shortness of breath. The respiration, however, continued harsh and dry, and the sound of expiration was abnormally distinct; but neither sibilus, rhonchus, nor any moist sounds were heard in the lungs, and the chest was everywhere normally resonant on percussion.

You cannot fail to have remarked the very different degree of rapidity with which the disease advanced in the several cases I have cited; and you have already heard that this difference is due, in part, to the more or less frequent occurrence of catarrhal accidents. Other circumstances peculiar to the patient, such as age, habits of life, and constitutional tendencies, are not without great effect on the progress and course of the disease; and, of these, the last-

named especially exercise a most important influence in promoting and modifying its development. You will easily understand that the existence of any constitutional condition, predisposing to bronchitis, must lessen the power of resistance, in the bronchial membrane, to the mechanical irritation exerted upon it, and, thereby, not only hasten the development of the disease, but add to its severity.

I must not altogether omit to notice one other external exciting cause of bronchitis, I mean the inhalation of hot, over-dried air, or of noxious vapours; and, in order to render this branch of my subject more complete, I shall quote a very remarkable case which came under my observation some years ago, and which is only one of many within my own personal experience.

CASE 27.—Donald M., aged fifty-eight, house-painter, was admitted an out-patient under my care, on March 28, 1862. The patient said that he had no personal nor family tendency to cough, and had been a perfectly healthy man until the spring of 1861, about twelve months before I saw him, when he was employed to repaint the inside of a large public building, which was being dried by means of open braziers burning a mixture of coke and charcoal. He very soon began to suffer from bronchial irritation, excited by breathing air impregnated with the fumes evolved by this combustion; and, before he had completed the job on which he was engaged, he suffered severely from cough, expectoration, and dyspnoea, which had continued up to the time of his coming under my care.

On admission the patient looked ill, and was much emaciated; his respiration was very laborious; the dyspnoea was great; and the cough and expectoration were most troublesome. The chest was everywhere resonant on percussion, and bronchitic sounds were heard throughout almost all parts of both lungs; the respiration was harsh, and the

expiration generally prolonged. The apex of the heart was felt beating in its usual position, and the sounds were normal. The case, in fact, when I first saw it, was one of chronic bronchitis, produced solely by the cause I have stated. The urine being perfectly normal, I desired a blister to be applied to the sternum, and ordered him a 5-grain compound hemlock pill at bedtime, and a draught containing diluted nitrohydrochloric acid, and tincture of gentian, with 10 minims of wine of ipecacuanha, and 20 minims each of the tinctures of larch and henbane, to be taken three times a day.

Under this treatment the patient improved most satisfactorily, and was discharged convalescent in about seven weeks; but, in consequence of exposure to a severe chill, returned again at the end of another month, suffering from a more acute attack of bronchitis. There was now much dyspnoea, and a very troublesome cough, attended by a glairy, frothy expectoration. The chest was everywhere normally resonant, but bronchitic cooing sounds were audible over the whole of both lungs. The skin was cool and the pulse quiet. I was now obliged to use different means, and prescribed a draught containing solution of acetate of ammonia, ipecacuanha and antimonial wines, compound tincture of camphor and camphor water, to be taken every six hours; directing the patient at the same time to confine himself to the house, and to apply over the whole back of the thorax a large linseed meal and mustard poultice, renewing it every few hours as it became cold.

In ten days the acute symptoms had much abated. Rhonchus, with prolonged expiration, and creaking in the lower lobes of both lungs, had superseded the sounds previously heard, and the expectoration, though copious, had become opaque and of a yellow colour; but there was still much cough and dyspnoea. The time was now come to revert to the treatment which had been so efficacious in the chronic

stage of the complaint for which he first sought relief; and I gave him a draught containing the same ingredients, in somewhat larger doses, with the like beneficial result. The cough and dyspnœa rapidly decreased, the expectoration diminished in quantity, and the man gained flesh and acquired the aspect of health. In a few weeks he was discharged, being then free from cough and dyspnœa, and apparently quite well. He still, however, raised a small quantity of clear, bluish mucus on first rising in the morning, and the respiration remained harsh, and the expiration somewhat prolonged, throughout both lungs.

These cases all belong to a class of which, except in certain districts, you will not find marked examples common, even among your poorer patients; and it may seem to you that they have little practical bearing upon the cases of bronchitis you are likely to meet with in private practice. I am, however, persuaded that the causes of the bronchial affection in all these patients are, within certain limits, in much commoner operation than might at first sight be supposed. Few private patients, it is true, are exposed to these noxious influences in sufficient intensity to excite bronchitis directly; but very many unsuspectingly inhale dust or bad air in a degree which gradually produces slight bronchial irritation, and renders them exceedingly liable to contract bronchitis on exposure to any immediate exciting cause. The constant breathing of hot and dry air in dwelling rooms, especially if combined, as is too common, with imperfect ventilation, is a fruitful source of bronchial delicacy. The employment of gas-lights in sleeping apartments, or even in sitting-rooms, unless proper appliances be in use for carrying off the products of combustion, and for admitting fresh supplies of pure air, produces an atmosphere in some degree analogous to that which was the cause of illness in the painter Donald M.

It is especially necessary to guard against these unwholesome influences in the case of persons who are suffering from bronchitis. It is still common for such patients to shut themselves up in close, hot, ill-ventilated rooms, with the view of avoiding exposure to cold. In so doing they, in fact, often aggravate their ailments and defer their recovery. Doubtless there are cases in which we are compelled to keep our patients for a time in an artificially heated atmosphere; but whilst the air of their apartments may be kept warm, it should never be allowed to become either dry or close; both of which conditions tend to increase the existing bronchial affection. The simple device of keeping a kettle of boiling water on the fire, with a spout long enough to throw a constant jet of steam into the atmosphere of the room, will suffice to moisten the air; and, with proper contrivances of screens or curtains to ward off draughts, free ventilation may always be obtained without danger to the most susceptible patient.

By far the greater number of bronchitic patients, however, actually do better when not kept in rooms at a high temperature; inasmuch as they sustain less injury to their general health, and are able to go about earlier, and with less risk of taking cold from any slight exposure, than those who have been more closely shut up. It is not so much a warm atmosphere that is needed by bronchitic persons, as ample protection from chilling of the surface; and this may be secured by suitable clothing. In fact, I have found that, upon the whole, chronic bronchitis is slower in its advances, and less speedily affects the general health, in persons whose duties take them much out of doors, than in those who, from their in-door occupations, would generally be presumed to be less exposed to causes of taking cold, and, therefore, less liable to accessions of their complaint.



## LECTURE VI.

## GOUTY BRONCHITIS.

BRONCHITIS OFTEN A SECONDARY DISEASE — RELATIONS BETWEEN CHRONIC BRONCHITIS AND THE GOUTY CONSTITUTION; GOUT DISPROPORTIONATELY COMMON AMONGST BRONCHITIC PATIENTS; FREQUENT CO-EXISTENCE OF GOUT AND BRONCHITIS IN SAME FAMILIES AND PERSONS; ALTERNATIONS OF GOUT AND BRONCHITIS IN THE SAME PERSON; SUBSIDENCE OF GOUTY SYMPTOMS FOLLOWED BY DEVELOPMENT OF BRONCHITIS; BRONCHITIS RELIEVED BY THE APPEARANCE OF GOUT.

GENTLEMEN,—Bronchitis may be either a primary or a secondary disease. Primary, when it is the mere result of exposure to cold or wet, or when the bronchial irritation is excited by the inhalation of mechanical or gaseous impurities into the lungs; secondary, when it arises out of some constitutional vice or some pre-existing disease. I have already brought before you, in previous lectures, several examples of primary bronchitis. To-day I propose to enter on the consideration of secondary bronchitis. Many years ago, when in charge of out-patients, I carefully investigated, in a methodical manner, the history of a large number of cases of bronchitis which came under my care during a certain season, with the view of ascertaining, as far as possible, what proportion of cases of this disease are of secondary origin.

The cases comprised in the inquiry, being those of persons who were able to attend in the out-patient room, were necessarily cases of chronic bronchitis. This, however, does not at

all invalidate their employment for my present purpose, more especially as we meet with a much larger number of cases of chronic than of acute bronchitis in practice.

I will not trouble you with the detailed results of that investigation, but I may mention that, after eliminating all doubtful cases, all cases of mere senile bronchitis, and all cases of which the records were incomplete, there still remained above one hundred reliable cases; in more than half of these the bronchitis was associated either with some form of gouty ailment, with some other disease of the lungs, or with valvular disease of the heart. The cases associated with gouty ailments largely predominated. In many of them the gout manifested itself in a regular form, either coincidentally or alternately with the bronchitis; in others, in that of chronic arthritic affections of the kind usually called rheumatic gout; and, lastly, in a very notable proportion of cases, in the form of psoriasis or eczema. In many instances, where the patient had not himself suffered from gout, there was a distinct history of some other member of his family having been subject to that disease.

It is, indeed, true that the gouty constitution is exceedingly common, not only amongst private patients, but also among the working classes, and especially among the artisans of London, who frequent our hospital out-patient rooms. But, common as it is, gout is found in a very much smaller proportion of the total number of our hospital patients than of the bronchitic class of patients taken by themselves. Hence I feel myself fully justified in the conclusion that there is really the intimate relation between a gouty constitution and bronchitis, more particularly in a chronic form, which I have so frequently taught in this theatre; and that, in many cases, where a hereditary tendency to gout has not been developed into the characteristic form of that disease, it manifests itself in the form of bronchitis.

By way of illustrating the relations between bronchitis and gout, I will read you the family and personal history of two patients who were under my care at the time when I was investigating the relations of bronchitis with gout and other constitutional disorders.

CASE 28.—Edwin B., aged forty-seven, portmanteau-maker, became an out-patient at the Middlesex Hospital, under my care, on December 1, 1865. His father had suffered from regular gout, and had died asthmatical at the age of sixty-three; his mother was also asthmatical; one of his brothers had suffered from attacks of regular gout, and a sister from chronic cough.

The patient himself had experienced several attacks of lumbago and sciatica; he had also for many years been subject, during the winter, to cough, which usually began in September or October, independently of any special cause of taking cold, and lasted until March or April; the cough was attended by much dyspnœa, and by frequent attacks of difficulty of breathing at night; these paroxysms usually came on at one or two o'clock in the morning, after he had been asleep, compelling him to sit up in bed for a longer or shorter time, according to the severity of the attack.

Such attacks of 'asthmatic dyspnœa,' as they are called by Dr. Graves in his admirable lectures on Clinical Medicine, are not rare in bronchitis. They are common, as I showed you in a former lecture, in dry catarrh; but they are also very frequent in the acuter recrudescences of chronic bronchitis, especially when associated with pulmonary emphysema. I may mention that asthma, which these paroxysms resemble in their general character, particularly in their tendency to recur in the early hours of the morning, is, like bronchitis, often associated with the gouty diathesis.

At the time of his admission, the patient's skin was cool; pulse, 84; respirations, 36 per minute; his cough was

troublesome, and the expectoration thin, white, and frothy; but he said that it was more generally thick and of a yellow colour, and had sometimes been streaked with blood; the urine was non-albuminous. He further said that he was never free from dyspnœa, not even in summer, and that he suffered from it more particularly in hot weather—a fact which I have verified in other cases; indeed, three of the severest cases of asthmatic bronchitis I have seen were in persons who had contracted the disease in hot climates—two of them in Brazil, of which they were natives; the other at the Cape of Good Hope. By one of these patients, himself a medical man of reputation and large experience in his own country, I was informed that the complaint from which he was suffering is very common in Brazil.

To return to the case under consideration: the chest was deep and broad; the veins of the neck and the superficial veins of the thorax were turgid, and most markedly so on the left side. The percussion resonance was clear over the whole front of the chest, especially in the mammary regions, and the clear sound encroached somewhat on the normal cardiac dulness; the resonance was also clear over the back of the thorax, excepting over the base of the left lung, where it was slightly deficient. The respiration was harsh; expiration prolonged. Rhonchus was more or less audible over both lungs, and moist sounds were heard with inspiration in the base of the left lung. The heart's apex was somewhat depressed.

The patient remained under observation until February, when he was discharged, almost well as regarded the bronchitis, and without having had any symptoms of lumbago or sciatica.

CASE 29.—Susan S., aged fifty-seven years, a married woman, was admitted an out-patient at the Middlesex Hospital, under my care, on December 8, 1865. Her father,

who had suffered from repeated attacks of regular gout, died, at the age of sixty-eight, of bronchitis; her mother had had rheumatic fever at the age of thirty, but had been in other respects a healthy woman; one brother had also had rheumatic fever at thirty, another had been gouty since middle life, and two sisters were subject to winter cough.

Our patient had had rheumatic gout, of six months' duration, ten years before her admission, and, during the last five years, she had suffered occasionally from rheumatic pains in the limbs. She had for twelve years past experienced shortness of breath, more particularly in damp or cold weather, and had also had cough every winter; the cough was always most troublesome in the morning on first rising, and was attended with a copious white, frothy expectoration; she was entirely free from cough in the summer, but even at that season had difficulty of breathing on exertion. For about four years she had noticed occasional swelling of her legs, which was aggravated by bodily exertion or by long standing. Her face also was stiff and puffy when she awoke in the morning. The catamenia had only ceased entirely for about a year.

On admission, her skin was cool; pulse, 84; urine, sp. gr. 1015, copiously albuminous; there was well-marked arcus senilis of both eyes. Her chest was flat in front; shoulders much rounded. The percussion resonance was perfectly clear over both the anterior and posterior surfaces of the chest. The respiration was sibilant throughout both lungs. The heart was in the normal position, and the heart-sounds were free from murmur. The cough was prolonged, abortive, and wheezing.

In this case you will observe that there was albuminuria in addition to the bronchitis and gouty pains, a complication by no means uncommon in bronchitis of gouty origin. We cannot be surprised at this, for, as you well know, a

certain form of renal disease is a consequence of the gouty constitution. The co-existence of albuminuria and bronchitis in this patient, was therefore due to one and the same constitutional condition. But I will not detain you now with explanations on this point, as I have quoted the case only for its etiological significance.

Additional support to the view that, in such cases as those I have related, the bronchitis and gout are correlative diseases, is afforded by the fact that they often alternate in the same person: an obstinate attack of bronchitis sometimes subsiding on the occurrence of a smart fit of gout; and again, at other times, a fit of gout being relieved by the development of bronchitis. I well recollect a striking example of this alternation in the case of an elderly man who was long under my care. His ailments were gout, psoriasis, and bronchitis; and he was rarely or never free from all of them. No two of the three ailments ever co-existed in his case; but it would happen that just as he was congratulating himself on having got rid of the gout, his skin would become covered with psoriasis, and this in a few weeks would take its departure, and be succeeded by an attack of bronchitis.

I have dwelt at considerable length upon this, as I am convinced, a very frequent constitutional origin of bronchitis, because its recognition affords the clue to the successful treatment of the disease in many cases; and, although it has been mentioned in express terms by Sir Henry Holland and several other authors, it has never, I think, been so prominently or specifically brought forward as to secure for it, in ordinary medical practice, the attention its importance deserves.

In many cases, no doubt, the gouty constitution appears only to produce a strong predisposition to bronchitis, which is first developed by some definite exciting cause, though,

very often, by a much slighter one than would be likely to produce the same effect in a healthy subject. In other cases, again, we find in persons of gouty constitution a certain degree of habitual, chronic, bronchial irritation, manifested by more or less constant scanty expectoration, which either merges slowly and almost imperceptibly, as life advances, into chronic bronchitis, or is more rapidly developed into it by exposure to vicissitudes of temperature, or by other immediate exciting causes.

In the case I am now about to relate, however, the patient had not only himself suffered from definite attacks both of gout and bronchitis, but so far from referring his bronchial symptoms to any exposure, he considered them only the sequelæ of the gouty attacks, which they immediately followed and seemed to supersede. This, in fact, occurred, as the following brief history will show, on the occasion of the attack for which he came under my care.

CASE 30.—Henry T., aged forty-eight years, a pallid, sallow-complexioned man, by occupation a tailor, was admitted an out-patient at the Middlesex Hospital, under my care, on January 12, 1866. He stated that he had for several years suffered from occasional attacks of regular gout, always commencing in the ball of the great toe. After the gout he had also been subject to what he called asthmatical attacks, and during the previous winter had suffered for some time from cough. Somewhat more than a fortnight before presenting himself at the hospital, he had been attacked by gouty pains in the knee, foot, and left elbow, accompanied by severe headache. In the course of a few days these pains had entirely subsided, except in the elbow; and, simultaneously with their disappearance, he had begun to suffer from cough and dyspnoea.

On admission, he complained much of dyspnoea, especially on first rising in the morning, and on moving about, and said that the cough was attended by a copious, thick, white ex-

pectoration. The left elbow was still hot, swollen, and tender; the skin was moderately warm; pulse, 90; urine, normal. The chest was everywhere resonant on percussion, indeed abnormally so in both mammary regions, and also over the posterior lower lobe of the left lung; the breathing was slightly laborious; the expiration was prolonged; and loud cooing sounds were audible over both lungs. The cardiac sounds were free from murmur, but the area of cardiac dullness was increased, and the heart's impulse was more diffused than in the state of health.

I gave the patient at first a draught containing solution of acetate of ammonia, spirit of nitrous ether, and tincture of squill during the day, and a pill, consisting of 2 grains of the acetic extract of colchicum, and 3 grains of Dover's powder, each night at bedtime. Under this treatment he rapidly improved: the gouty symptoms in the elbow disappeared almost immediately, and the cough and expectoration soon greatly abated. He still, however, suffered from dyspnoea; and, as there was emphysema in both lungs, he probably continued to do so permanently.

The next case I shall read to you is that of a man who was a patient of mine at intervals for more than three years; and in whom, as you will observe, the bronchitis, which at first alternated with gout, ultimately superseded it.

CASE 31.—Edward G., aged forty, groom, was admitted an out-patient at the Middlesex Hospital, under my care, January 14, 1863. He was suffering from regular gout, attended by slight bronchitis, which became more severe as the gout subsided. The bronchial attack was very tedious, being aggravated by every exposure incidental to his occupation. In April he had another attack of acute gout in the feet, probably brought on by his continuing to drink beer freely, and he then lost the bronchitis.

He was re-admitted late in the autumn for an attack of



bronchitis without any gouty symptoms. He had taken cold, and the attack had begun with nasal catarrh and sore throat. His voice was hoarse; skin, cool; pulse, 75; urine, normal. The chest was resonant on percussion; and, with the exception of rhonchus in the lower and posterior parts of both lungs, the breath-sounds were normal.

From that time he lived more carefully, and had no return of regular gout whilst under my care; though he suffered occasionally from pains in the knuckles. He had, however, attacks of bronchitis once or twice annually; and, considering the exposure inevitable in his line of life, and his obviously confirmed tendency to the disease, a complete cure was scarcely to be expected.

I shall now relate a case in which the gouty diathesis was manifested in an irregular form, varying in character at different times, but always alternating with bronchitis in the same manner as we have seen in the cases of regular gout.

CASE 32.—Hugh T., aged thirty-four years, pianoforte maker, became an out-patient at the Middlesex Hospital, under my care, on February 12, 1866. He had then been ailing for a year; during which time he had suffered alternately from cough and from rheumatic pains in the knees and elbows. At the time of his admission he had slight cough and dyspnœa, but he presented himself at the hospital on account of gastralgia of some weeks' standing. The pain came on soon after eating, and was excessively severe.

This gastralgia, I may observe, was but a different manifestation of the same disorder of health which induced the bronchitis and the so-called rheumatic pains. This form of dyspepsia is very common in persons of gouty diathesis, who have never had paroxysms of acute gout; and, like other irregular forms of that disease, may either be relieved by a fit of regular gout, or may give place, as you will see it did in

the present instance, to some new train of irregular gouty symptoms.

On this occasion, the patient was soon relieved from his ailments by the use of bismuth and magnesia, in combination with a bitter infusion, and of small doses of blue pill, rhubarb, and ipecacuanha; but he returned, on May 27, with pain and excessive tenderness in the toes and soles of the feet, and with patches of lepra on the arms and legs. He said that he had of late suffered but seldom from gastralgia, and then only in a slight degree, neither had he any cough, but he was not free from dyspnœa. He was treated with iodide of potassium, ammonia, and colchicum; to which, as the pains abated, small doses of arsenic were added.

On July 22, the pains had for some time entirely left him, and the eruption was gradually disappearing; but he had again begun to cough and expectorate, and complained of increased shortness of breath. The chest was normally resonant, but harsh rhonchus was audible throughout both lungs. He was ordered small doses of hydrochloric solution of arsenic and diluted hydrochloric acid, with cod-liver oil, and a sedative pill at night to allay the cough. He was soon relieved, and ceased to attend.

Late in October, he again came under treatment for lumbago and pains in the knees and elbows, having then no cough; but the lepra, which had never altogether left him, was much increased. As these ailments yielded after a six weeks' course of treatment, he once more began to cough, and suffered from chronic bronchitis throughout the winter.

On April 20, 1867, he was quite free from lepra and gouty pains, and had only a little cough and expectoration on first rising in the morning. He was put upon a course of nitrohydrochloric acid and tincture of larch, and was discharged quite well early in June.

The last case I shall read you, of this character, is that of a

woman who was under my care, at intervals, for upwards of a year.

CASE 33.—Mary Anne F., aged fifty, a domestic servant, became an out-patient at the Middlesex Hospital, under my care, on April 20, 1865, for chronic bronchitis. On admission, she stated that her father had died of asthma, in middle life, and that she had herself, for many years, been subject to cough in winter and spring; more particularly since the cessation of the catamenia at the age of forty-three. She suffered also from palpitation and shortness of breath on exertion; and, when she took cold, she had often such difficulty of breathing as to prevent her from lying down in bed. She had likewise, on several occasions, been attacked by lumbago or sciatica.

On the setting in of fine weather, her cough subsided, and she did not reappear at the hospital until September 15, when she was re-admitted for a severe attack of lumbago, accompanied by shooting pains in the hands, with tenderness and slight swelling of several of the knuckles.

The pains were soon relieved by treatment with iodide of potassium, carbonate of ammonia, and small doses of wine of colchicum; but they had not entirely subsided, when, on October 6, the patient began to complain of cough. On that day I examined her chest, and found it normally resonant. The respiration was dry and harsh, and the sound of expiration audible and prolonged throughout both lungs. She was ordered to take 5 grains of the compound pill of hemlock each night at bedtime, in addition to the draught she was taking during the day.

On October 20, she had been entirely free from pains for more than a week, but her cough was very troublesome, and the expectoration frothy and copious. Rhonchus was heard in the posterior bases of both lungs; and also, on deep inspiration, in the upper lobe of the right lung. Faint crepitation was

also occasionally heard in the lower lobe of the left lung. She was now treated more specially for the bronchitis, and took a draught, consisting of infusion of senega, carbonate of ammonia, and tincture of squill, with 20 minims of tincture of henbane, during the day, and a pill of Dover's powder and acetic extract of colchicum at night. She continued this treatment for some time with very good results; but her case, like most of those I have seen in which bronchitis has alternated with gouty ailments, proved very tedious. She had fresh accessions of cough repeatedly during the winter, not always arising from special causes of taking cold; but she exhibited no renewal of her gouty symptoms, and ceased her attendance in the early warm weather.

I have already told you that, when bronchitis occurs in persons of the gouty constitution, it frequently happens, on the one hand, that bronchitis makes its appearance on the subsidence of the gouty symptoms; and again, on the other hand, that a fit of gout entirely relieves the bronchitis. The last cases I have related belong to the former of these two categories; I shall now give you the history of two other cases which exemplify the latter, and not less common, mode of alternation.

CASE 34.—Alfred B., aged forty-nine years, by occupation a house painter, was admitted an out-patient at the Middlesex Hospital, under my care, on November 3, 1865. He was a tall stout man, with a broad capacious chest. His family history showed a strong tendency to bronchial affections, and also a gouty taint: his father, mother, and brother having died, he said, of asthma, which evidently meant chronic bronchitis and its consequences; whilst two living brothers suffered from the same disease, and another from gout. He himself had frequently had gout, most commonly in the knees, but also in the toes, wrists, and elbows. He said that he was a moderate man, drinking nothing but beer, and not more than two or three pints a day. He had been subject to chronic

cough in winter for seven or eight years, and was very liable to take cold even in summer; but he did not attribute his ailments to any special exposure.

On admission, he was suffering from dyspnœa and cough, attended by a scanty, thick, white expectoration. His face was puffy; tongue, fairly clean; pulse, 90. The chest rose evenly in respiration, and was equally and normally resonant on percussion on the two sides. The respiration was slightly laborious. The breath-sounds were normal over the upper and anterior parts of both lungs, but mucous crepitation was audible in the base of the right lung. The percussion resonance was perfectly normal over the posterior bases of both lungs; but rhonchus, intermixed with moist crepitation, was heard, from the base upwards, as high as the angle of the scapula on both sides. The heart-sounds were normal in character and position. The urine was high-coloured, acid, and contained no albumen. I prescribed a draught, with tincture of squill, solution of acetate of ammonia, and 20 minims of tincture of henbane, to be taken every six hours; and a pill containing 1 grain each of blue pill and ipecacuanha powder, with 3 grains of powdered rhubarb, to be taken every night at bedtime.

At the end of a week he was much better, and the report in the Case-book on November 14, is, that the cough was much diminished and the expectoration had become more scanty. The breath sounds had become normal, with the exception of slight sibilus and clicking in the base of both lungs. But, at this time, gouty symptoms were making their appearance, and in a few days a regular fit of gout came on, during which the cough entirely disappeared.

This is, in brief, the history of a mild case of gouty bronchitis, in which the bronchial affection was evidently relieved by the supervention of the gouty paroxysm. The case was, comparatively, a slight one, and when the patient first came

under my care he was so entirely free from any gouty symptoms, that I did not deem it necessary to resort to any specific treatment for the constitutional affection. I have, therefore, read it to you, not with reference to that branch of the subject, but merely as another illustration of the intimate relation between gout and chronic bronchitis, which was shown in this case not only by the alternation of the two diseases in the individual patient, but also by the existence of one or other of them in so many members of his family.

The second case is one which I have had the opportunity of watching at intervals during a long period, and which is still under observation.

CASE 35.—George S., aged fifty-nine, married, a hat maker by trade, first became an out-patient at the Middlesex Hospital, under my care, on October 20, 1864. He then stated that he had for many years been subject to cough and expectoration with dyspnoea, in summer as well as in winter, as much in hot as in cold weather. A medium temperature suited him best, extremes in either direction always increasing his ailments. He had had regular gout for the first time twenty years before, and said that he was in the habit of suffering from gouty pains in the hands and feet; but he was free from them at the time of his admission. He was also subject to occasional psoriasis.

On inquiry he admitted that he was a confirmed beer-drinker, though, in his own opinion, a moderate one. What he considered moderation was, however, in all probability, excess, for many years' observation has led me, in common with the late Dr. Todd, to the conclusion that to no circumstance is the prevalence of gout among our London artisans more attributable than to the large habitual consumption of malt liquor.

The patient himself referred his complaints to exposure to vicissitudes of temperature during his work; but, the

appearance of the gout having preceded that of the bronchial affection, and the bronchitis having been accompanied or followed by gout in three out of the four attacks I have witnessed, we may reasonably assume that these vicissitudes were, at most, only the immediate exciting causes of irritation in a bronchial membrane already very strongly predisposed to disease by existing constitutional derangement.

When admitted, George S. was suffering from a pretty severe attack of bronchitis, attended by much dyspnoea, and by a copious, frothy expectoration; but he said that, although he was never altogether free from expectoration, any more than from cough, it consisted only, during the intervals between the more acute attacks, of a small quantity of thick, transparent, bluish mucus.

Now this is the exact counterpart of what we meet with every day in bronchitic patients: more particularly in those who have also a gouty constitution. They habitually raise in the early morning, and it may be also at rare intervals during the day, little pellets of tenacious, bluish, starch-like mucus, sometimes studded with darker specks arising from admixture with carbonaceous matter. This ailment, which may perhaps be almost too slight to attract the patient's attention, is quite compatible with good health in all other respects, but it is, nevertheless, the proof of an abnormal condition of the bronchial membrane. In the healthy state, only just as much mucus is secreted as is necessary to keep the bronchial membrane soft and moist enough for the due performance of the function of respiration. We may therefore safely assume, as a rule, that wherever there is expectoration, however small in quantity, the membrane is not in a perfectly healthy state; and is, consequently, far more liable than a membrane in the normal condition to suffer from any immediate exciting causes of bronchitis, of whatever kind.

To return to the patient, however, I should tell you that

he was treated successively with infusion of senega, carbonate of ammonia, and tincture of squill, and subsequently with nitro-hydrochloric acid, in combination with tincture of gentian, ipecacuanha wine, and tincture of henbane. On December 11 he was in all respects greatly improved, and was discharged comparatively well on January 16, 1865.

He was re-admitted on May 6 of the same year, suffering from gout in the fingers of the right hand, and also from cough, attended by the white, frothy, mucous expectoration characteristic of recent bronchitis. There was now, also, slight œdema of the ankles; but the urine was free from albumen. The chest was found on examination to be normally resonant on percussion; sibilus and rhonchus were more or less audible throughout both lungs; the expiration sound was prolonged, especially in the upper lobes; and mucous crepitation was heard in the posterior base of the right lung.

Taking into consideration the mixed character of the illness, showing the actual co-existence of gout and bronchitis, I prescribed a combination of medicines calculated to meet both aspects of the case; that is to say, I gave 4 grains each of iodide of potassium and carbonate of ammonia, 10 minims of wine of colchicum, and 20 minims each of the tinctures of squill and henbane in  $1\frac{1}{2}$  ounce of camphor water, three times a day, together with 5 grains of the compound pill of hemlock every night.

This is a plan of treatment which, modified according to circumstances, I have often found very serviceable in similar cases, and under its use George S. gradually improved; but, at the end of a fortnight, his appearance being anæmic, a grain of sulphate of iron was substituted for the ammonia in the draught. The gout soon disappeared; but the mucous crepitation in the base of the right lung still continuing without change, I ordered a draught containing 20 minims



each of tincture of perchloride of iron and tincture of henbane, with 10 minims each of ipecacuanha wine and diluted hydrochloric acid in peppermint water, to be taken three times a day. My patient now recovered rapidly; but continued under occasional observation till the month of August.

He did not present himself again until May 5, 1866, when, curiously enough, at the exact interval of one year from the date of his previous admission, he was re-admitted under my care in an almost identical condition. The finger-joints were again swollen and painful, and he was suffering in the same manner from cough and dyspnœa. The bronchitis, however, was in a more advanced and chronic state; the expectoration being now thick, opaque, and muco-purulent, instead of glairy and frothy as on his previous admission.

He was treated in a similar manner, but improved more slowly than the year before. The cough varied from time to time, but, though better on the whole, was by no means gone, when, towards the end of June, with the accession of hot weather, he was attacked by gout in a more pronounced and regular form, affecting successively the balls of both great toes, the ankles, and fingers. On the appearance of gout in this acute form, the cough and expectoration at once abated, and I then ordered him a draught containing 1 grain of sulphate of iron, 5 grains of iodide of potassium, 15 minims of wine of colchicum, and 1 drachm of glycerine in peppermint water, to be taken three times a day; and also a pill for night containing 2 grains of acetic extract of colchicum and 3 grains of Dover's powder. He continued this treatment, with some modifications, for a month, and was discharged quite well on August 4.

The relief, however, on this occasion was not of long duration, for on December 5 he applied for re-admission. His cough had returned, with much wheezing and dyspnœa, and with the frothy, transparent expectoration I have

described as characteristic of recent bronchitis. His skin was cool; pulse, 90, but quite regular; the sides of the chest rose evenly in respiration, and were equally and normally resonant on percussion; the heart-sounds were normal; rhonchus and sibilus were audible over the posterior lower lobes of both lungs, intermixed with faint mucous crepitation in the base of the left lung; the urine was normal. At this time he was quite free from gouty pains, and I ordered him a draught with tincture of squill, ammonia, and 20 minims of tincture of henbane, to be taken every six hours; but, bearing in mind his gouty tendencies, I added the night-pill of colchicum and Dover's powder which he had taken the year before.

He soon improved greatly as regarded the cough, and the expectoration diminished and became opaque and of a bluish colour; but the subsidence of the bronchial affection was again simultaneous with the development of gout, though of a less acute character than on the last occasion: this difference being possibly due to the specific treatment the patient had been undergoing before its appearance. In addition to the night-pill he again took the iodide of potassium, with ammonia and colchicum wine, and soon discontinued his attendance, being then quite free from both gout and bronchitis.

You will observe, in this case, that the interval between the two last attacks was shorter than that between the earlier ones. This is very apt to be the case in gouty affections, the attacks of which usually tend to become both more frequent and more obstinate on each successive recurrence.

It is, however, peculiarly difficult to regulate the habits of hospital out-patients; and I strongly incline to believe that this man, although he strictly followed my directions as to medicine, generally disregarded my injunctions as to diet and abstinence from malt liquor. Moreover, he continued

to work at his occupation as long as possible before laying up, and resumed work again as soon as possible after an attack of illness. He was never, therefore, for more than a short time exempt from the exposure to vicissitudes of temperature, which no doubt tended, more or less, to excite the frequent exacerbations of his bronchitic ailment, although not, in my opinion, the original or even the principal cause of it.

## LECTURE VII.

## GOUTY BRONCHITIS.

FREQUENT ASSOCIATION OF PSORIASIS AND ECZEMA WITH BRONCHITIS—RELATIONS OF ECZEMA AND PSORIASIS WITH GOUT; PREVALENCE IN GOUTY FAMILIES; ALTERNATIONS OF GOUT, PSORIASIS, AND BRONCHITIS—ALBUMINURIA ASSOCIATED WITH BRONCHITIS AND GOUT; BRONCHITIS WITH GOUTY KIDNEYS—ASSOCIATION OF GRAVEL WITH BRONCHITIS; ALTERNATION OF GRAVEL, PSORIASIS, AND BRONCHITIS; OF STONE, GOUT, AND BRONCHITIS—TREATMENT OF GOUTY BRONCHITIS.

GENTLEMEN,—Although, in a recent lecture, I entered very fully into the consideration of the relations existing between gout and bronchitis, I must again, to-day, beg your attention to some further details on a subject of so much interest and importance both in its etiological and practical aspects. You cannot fail to recollect that I have very often pointed out to you certain cutaneous affections, and more particularly psoriasis and eczema, as of frequent occurrence in gouty persons, and being, in fact, due to the gouty constitution. According to the view, therefore, expressed in my last lecture, that chronic bronchitis is also in many cases referable to this same constitution, it is by no means surprising that we should have found psoriasis associated with the bronchitis in several of the patients whose cases formed the bases of my comments. My present purpose being only to show that bronchitis, especially in its chronic form, is frequently a secondary disease, arising from some constitutional disorder, it would be out of place to enlarge upon the relations between these cutaneous affections and the gouty constitution. I may,

nevertheless, observe in passing that several of the best observers and highest authorities in the profession have recognised that psoriasis and eczema are, at least for the most part, of constitutional origin.

Sir Thomas Watson, in his classical work on the 'Principles and Practice of Medicine,' when speaking of lepra and psoriasis as closely allied diseases, says, with respect to the former, that it is a blood disease depending upon some poison introduced from without, or more probably bred within the body; and with respect to both these forms of cutaneous disease, that he believes they sometimes depend upon the presence or the generation of an excess of acid in the system. This exactly accords with the opinion I have expressed concerning the frequent relation of psoriasis and eczema with a gouty constitution: for urate of soda, a poison bred within the body, has been found in the blood of gouty subjects in abnormal quantity. Moreover, the existence of this relation has been pointed out in more or less positive terms, by several other medical writers, and amongst others by Sir Henry Holland and Dr. Garrod. Sir Henry Holland says, in his eminently suggestive work, 'Medical Notes and Reflections,' that he has 'so often seen psoriasis prevailing in gouty families—sometimes alternating with acute attacks of that disease, sometimes suspended by them, sometimes seeming to prevent them in individuals thus disposed, that it is difficult not to assign the same morbid cause to these results'; and Dr. Garrod mentions in his book 'On the Nature and Treatment of Gout,' that several instances of skin disease in connection with gout have come under his observation, and amongst them cases of chronic eczema and psoriasis, which have either alternated with, or accompanied, regular articular gout. He also relates the case of a gentleman who, a few months after the disappearance of gout, was attacked by an eruption of eczema, which resisted arsenical treatment, but

yielded readily to remedies adapted to the cure of gouty inflammation.

I shall now narrate, very briefly, the history of a patient, which very strikingly illustrates the intimate relations that in many cases subsist between bronchitis, psoriasis, and gout.

CASE 36.—Jane S., aged thirty-five years, the wife of a publican, was admitted into Murray Ward under my care, on September 19, 1865. She was stout in figure, and had been accustomed to drink ale and porter to excess. From childhood upwards, she had suffered from psoriasis, which was an hereditary ailment in her family : her sister and two maternal half-brothers being subject to it, as had been also her mother, and her maternal grandfather and aunt ; but in her case, the disease had commenced at an earlier period of life than in her sister or brothers. She had always been subject to catarrh, and, for several years past, had suffered from occasional attacks of rheumatic gout, with œdema of the feet. During each of the last three winters she had been laid up with bronchitis.

On admission she suffered much from cough, attended by a tenacious, frothy expectoration. Both the trunk and extremities were covered with psoriasis ; the balls of both great toes were red, swollen, and tender, as were also the left elbow and wrist, and there was considerable œdema of the feet and legs. The pulse was 120, soft and compressible ; the respirations, 24 in a minute, were jerking and laborious. The tongue was red at the edges, and coated on the dorsum with a thick grey fur. The bowels were rather loose, and there was frequent vomiting after food. The urine was scanty, sp. gr. 1018, and contained a large amount of albumen. The chest was everywhere resonant on percussion, and sibilus and rhonchus were audible over the posterior and lower parts of both lungs. The heart was seen beating below the xiphoid

cartilage, and its impulse was diffused; the cardiac sounds were feeble and free from murmur.

At the moment of admission but little could be done for her, the tendency to vomiting and the looseness of the bowels forbidding the use alike of expectorants and of purgatives. I accordingly ordered her a light diet of milk, arrowroot, and custard pudding, allowing also, in consideration of her previous habits, a small quantity of brandy; and I gave her, in the way of medicine, a draught containing 2 drachms of solution of acetate of ammonia, and 20 minims of nitric ether every six hours, and 5 grains of the compound pill of hemlock every night. Notwithstanding the teasing character of the cough, I dared not give her any form of opiate, because I inferred from the vomiting and diarrhœa that she was threatened with uræmic poisoning; and, in such a state of the system, the use of opium would have been very hazardous, and might even have led to a speedily fatal result.

This was, as you may observe, a more than usually complicated case: for the patient was actually suffering, at the time of her admission, from bronchitis, gout, psoriasis, and albuminuria; but, various as these complications apparently were, there is no doubt in my mind that all of them were due to the same constitutional cause: namely, a strongly developed gouty dyscrasia.

Under the simple treatment I have detailed the patient improved considerably in the course of a short time. She lost the sickness and diarrhœa, and the gout abated in severity; but the cough continued troublesome, and the urine still contained a large quantity of albumen. In proportion, however, as the gout subsided, there was a decided aggravation of the cutaneous affection. On October 6, it is noted that the pulse had fallen to 90, but the cough remained troublesome, and the patient was raising a sputum which consisted chiefly of tenacious, transparent mucus, slightly

tinged and specked with blood; but which also contained an admixture of opaque, dark-coloured phlegm. The chest was everywhere normally resonant on percussion, but the respiration was sibilant, the expiration prolonged, and rhonchus was heard in the lower and posterior parts of both lungs. The cardiac sounds were free from murmur.

The patient being now relieved from any tendency to sickness or diarrhoea, and able to take a fair quantity of nourishment, there was no longer the objection to the administration of expectorants which existed on her first admission. I therefore added 10 minims of tincture of squill, and 20 of tincture of henbane to her draught, and continued the hemlock pill at night, with such good results, that, in three or four days, the cough had become much less troublesome, and the expectoration had diminished in quantity. The breath-sounds had also improved; the rhonchus being replaced by dry, harsh respiration. The pulse remained about 90, the tongue was moist and clean, the bowels rather confined, and the psoriasis less troublesome; but she now again complained of pain in the great toes.

Two days later she had distinct gouty pains, not only in the toes, but also in the knees, wrists, thumbs, and knuckles; whilst at the same time the cough and expectoration had still further subsided, and the skin had become softer and much less irritable. The urine was very acid, sp. gr. 1023. It became turbid with lithates after standing to cool, and deposited with heat and nitric acid a considerable proportion of albumen.

I now put her again on the acetate of ammonia draught she had taken at first, with the addition of 20 grains of acetate of potash, and 10 minims of colchicum wine; keeping her bowels freely open by means of daily doses of sulphate and carbonate of magnesia in peppermint water.

On October 16, the gout had entirely disappeared; she



was nearly free both from cough and expectoration, and, except that the respiration was a little harsh and expiration still somewhat prolonged, the breath-sounds were normal. There was still, however, slight œdema of the feet, and the psoriasis had once more become very troublesome. She was ordered to have an alkaline warm bath every third day, and to take 10 grains of light carbonate, and 15 grains of sulphate, of magnesia, with 10 minims of colchicum wine, and 5 of Fowler's arsenical solution, in 1½ ounce of peppermint water, three times a day.

This is a combination which, with various modifications as regards strength, I have found exceedingly useful in cases of gouty psoriasis, in which arsenic alone frequently fails to effect a cure.

On October 20, the cough and expectoration had altogether subsided, the pulse was under 80, the bowels were rather confined, and the urine contained only a trace of albumen, but the psoriasis continued obstinate.

From this time there was no return of the other ailments, but the psoriasis was difficult to conquer, and the treatment underwent several minor changes, including the application to the eruption of a lotion containing borax and glycerine, from which she derived great advantage.

On November 20 she was discharged convalescent, and at that time had no symptoms either of bronchitis or gout; her skin was smooth and quite free from irritation, and the marks of the eruption were rapidly disappearing; but the urine never became quite normal, containing to the last a trace of albumen.

This case is an interesting and instructive one, not only as illustrating the intimate relations between the bronchitis, gout, and psoriasis, during the actual illness of the patient, but also on account of the family history attaching to it, which shows that constitutional psoriasis partakes equally

with gout of an hereditary character. During the illness itself, you will have observed that the first abatement of gout was accompanied by increased obstinacy of the bronchitis and aggravation of the cutaneous affection; that, somewhat later, the subsidence of the bronchial irritation and the mitigation of the psoriasis were simultaneous with a fresh outbreak of the gouty inflammation; and that, finally, on the disappearance of the gout as well as the bronchitis, when convalescence was becoming established, the psoriasis once more increased in severity, and long continued obstinate. In view of such systematic alternations of the morbid phenomena, it appears to me impossible to avoid the conclusion that all the three diseases were merely different manifestations of the same constitutional state.

I must not omit, also, to direct your attention to the presence of albuminuria in this patient. Albuminuria is another disease that is frequently caused by a gouty constitution. It is, in such cases for the most part, due to that form of diseased kidney to which Dr. Todd long ago gave the name of 'gouty kidney.' In these cases, deposits of urate of soda are very frequently found in the kidneys after death, in the form of white streaks; which, on microscopical examination, are seen to consist of fine crystals, closely resembling those found in gouty deposits about the joints. Permanent disease of kidneys had probably already taken place in this patient, for the urine was persistently albuminous, though the proportion of albumen varied from time to time, and amounted only to a trace when the patient left the hospital.

The history of a patient who was some time ago under my care in the hospital, so well illustrates the relation that exists between gout, bronchitis, and chronic renal disease, that I will read it to you, although it would be foreign to my purpose to dilate upon all the points of interest it presents.

CASE 37.—Mary B., a married woman, aged fifty-one years, was admitted into Northumberland Ward on September 17, 1867. She came of a gouty family, and her mother had suffered from asthma. She had, at one time, drunk to excess both of beer and spirits, although, according to her husband's statement, she was now reformed. Ten years before her admission, she had been laid up for three months with what had been called rheumatic fever; and three years later she had had a slighter attack of a similar kind. From the time of the second attack she had frequently suffered from pains in the ankles and knees. She had also been subject to transient attacks of catarrh, and to shortness of breath on using any exertion, but not to habitual cough until the Christmas previous to her admission, since which time she had never been free from it.

On admission, her hands were much deformed by the arthritic inflammation. On the wrist and knuckles of the right hand there were several movable, roundish, hard nodules, which were evidently gouty deposits; and there was, also, one similar nodule on the pinna of the left ear. The chest was abnormally resonant on percussion over the anterior walls, excepting over the præcordia; the resonance was also clear over the back of the thorax, excepting over the lower lobe of the right lung, where it was rather deficient. The respiration was laboured, and the upper intercostal spaces were depressed, as if drawn inwards, during the act of inspiration. The breath-sounds were dry, harsh, and sibilant; rhonchus was here and there audible in both lungs, and dry crepitation of slightly metallic tone was occasionally heard near the middle of the right scapula. The heart's impulse was feeble, and the apex was felt beating below the sixth rib, in a line with the nipple. The heart-sounds were free from murmur. The liver was enlarged, and extended an inch and a half below the margin of the ribs; it was exceedingly

tender on pressure. The cough was frequent, prolonged, and wheezing, and often terminated in retching and vomiting; the sputum was scanty, tenacious, and opaque. Pulse, 80; respirations, 20 in a minute; temperature in the axilla, 99.0°. Urine copious, acid, specific gravity, 1015, showing no trace of albumen, whether treated with heat or nitric acid.

For some days after admission there was little change in her condition, but the expectoration, which at first had been small in quantity, soon increased, and became muco-purulent and somewhat nummular in appearance. The dry metallic-toned crepitation began to be heard almost persistently about the point of the right scapula, and became also faintly audible at the right nipple. Her pulse on one or two occasions rose to 94, and the temperature varied between 99.0° and 100.3°. The urine continued free from albumen; its specific gravity ranged from 1012 to 1017.

On September 29, moist crepitation was heard in the base of the right lung, and the patient complained of a sense of sinking and of pain in the sternal region.

There was again little variation in her state until October 13, on which day I observed that her manner was strange and absent, and that she appeared to answer questions with reluctance. In the night she became maniacal, and, next day, would neither put out her tongue nor answer when spoken to, and evidently had no idea where she was. Her skin was covered with profuse perspiration. She had retention of urine, and when it was drawn off by the catheter, it was found, for the first time, to contain a small quantity of albumen. Her tongue was clean, appetite ravenous, pulse 108. Two days later she regained her consciousness, but had an anxious, abstracted look, and said that she was lost. She answered questions slowly, and not always pertinently. The urine now had a specific gravity of 1025, deposited a copious sediment of lithates, and continued slightly albuminous.

On October 19, her face was flushed and frequently distorted by convulsive twitchings, her speech thick and incoherent, and her pupils dilated. She died rather suddenly at 6 P.M. on the 20th.

At the post-mortem examination much fat was found on the trunk, but the limbs were emaciated. The substance of the brain was pale and anæmic, and there was much fluid beneath the arachnoid. On microscopical examination of portions of the pia mater taken from the upper part of the spinal cord, the walls of many of the small arteries appeared to be much thickened. This appearance was not found in portions of pia mater taken from the surface of the brain. The right lung was everywhere attached to the parietes of the chest, by firm, old adhesions. The left lung was not adherent, but on its surface were scattered patches of miliary granules. In the upper part of the lower lobe of the right lung was a large, irregular, ragged cavity, around which, for some distance, the lung presented firm yellow infiltration. Scattered through the rest of the lung, with the exception of the apex, were yellow cheesy deposits, about the size of peas. The left lung was freely crepitant, but in the upper lobe were a few cheesy deposits. The anterior parts of both lungs were emphysematous. The bronchial glands were enlarged and infiltrated with opaque yellow matter. The pericardium contained a couple of ounces of turbid flaky fluid. The heart was slightly increased in size, and covered with patches of recent granular lymph; the valves were normal. The liver was large and fatty. Many of the mesenteric glands were much enlarged, and converted into yellow cheesy masses. In the lower part of the ileum were a few small, yellow deposits, and one or two ulcers with thickened infiltrated edges.

The kidneys were much contracted; their capsules were thickened and adherent, their surfaces granular, and studded with small cysts. On section the cortices were found to pro-

ject scarcely a line beyond the bases of the pyramids. In the pyramids were several opaque, yellowish-white, linear deposits, which, on microscopical examination, were found to consist of needle-shaped crystals, some of which were isolated, others agglomerated into larger masses.

This, then, was a case of granular disease of the kidney, with gouty deposits in the stroma of that organ. Although, from the history of the woman's case and her anæmic aspect, I suspected the existence of this form of renal disease, and examined the urine repeatedly, no albumen was found in it until the last days of life, when a mere trace made its appearance coincidently with uræmia and pericarditis. Neither were there, from first to last, any dropsical symptoms; the ankles were never œdematous, nor was the face observed to be puffy.

I apprehend that the lung disease in this patient had commenced as bronchitis, which passed into catarrhal pneumonia, and led to the cheesy deposits and cavity found in the left lung. The miliary granulations were doubtless a secondary consequence of the cheesy deposits in the lungs and bronchial glands.

The co-existence of bronchitis and either of the before-mentioned cutaneous diseases, in the same person, would always lead me to suspect the presence of a gouty taint in the patient; but now and then we meet with cases in which neither the personal nor the family history bear out the supposition. I will now invite your attention to such a case.

CASE 38.—Robert L., aged fifty years, a pianoforte-maker by occupation, became an out-patient at the hospital, under my care, on April 27, 1866.

His parents had been healthy and long-lived. One of his brothers had died of asthma, and two sisters of apoplexy, but he was not aware that any of his family had been gouty. He had not himself had either gout or rheumatism, but he had

for many years suffered more or less severely from eczema, affecting the whole surface of his body. He had been subject to cough in winter for four years; it had commenced with a severe cold, which he had contracted from passing to and fro, in very cold weather, between his home and a close, hot workshop. He was laid up at that time for three weeks with a bad cough and much difficulty of breathing. At the commencement of the winter of 1864, he had had so severe a return of these ailments, that for several nights he could not lie down in bed, but was relieved by the application to the chest of linseed meal poultices sprinkled with oil of turpentine. During each of his attacks of catarrh, the dyspnœa had been very urgent, often compelling him to stand in the street from a sense of impending suffocation. His urine was usually clear and pale-coloured, but he had observed it deposit a copious red sediment at the times when his difficulty of breathing had been greatest.

On admission, his skin was cool; pulse, 84, regular; urine pale-coloured, and of low specific gravity. His cough was troublesome, and he was raising a frothy, yellowish-coloured mucus, in no great quantity. There had recently been extensive eczema, with which the skin was still rough, though no longer irritable. The chest was broad, deep, and protuberant, both in front and over the lower posterior lobes of both lungs. The percussion resonance was abnormally clear over the whole front of the chest: on the left side almost masking the normal cardiac dulness, and on the right side encroaching on the dulness of the hepatic region. There was excessive resonance from apex to base over the back also. The heart was seen beating feebly in the epigastrium, below the xiphoid cartilage; the heart-sounds were faint, but free from murmur. The respiration was not particularly laborious; but the sounds of inspiration and expiration were divided by a distinct interval of time in both infra-clavicular regions.

Rhonchus was heard in the posterior bases of both lungs, but there were no moist sounds. He soon improved as the warm weather set in, and discontinued his attendance.

On December 21 of the same year he was re-admitted for a fresh attack of bronchitis. There was no change in the physical signs, excepting that moist crepitation was now heard in the bases of both lungs. As soon as the more acute symptoms were relieved, he was put upon a course of treatment with tincture of larch added to the nitro-hydrochloric acid and gentian draught, and from this he appeared to derive very great benefit. He continued it throughout the winter, and, in March 1867, said that he had but little cough or expectoration, except on first rising in the morning; and was so much less troubled by difficulty of breathing that he could go up and down stairs quite freely.

He again presented himself at the hospital in October 1867, on account of a severe attack of eczema, from which, indeed, he had never been entirely free since his former attendance, but which now caused extreme irritation, especially on the face. He said that he had been, throughout the summer, more nearly free from cough, expectoration, and dyspnoea, than at any time since he had first suffered from them. The physical signs, however, continued unchanged, and the respiration was somewhat laboured. He remained under treatment for the eczema for several weeks, and was greatly relieved.

In May 1868, he again came to show himself; he still had a certain amount of chronic eczema, but he had passed through, even, the foggy weather of the winter and spring with comparative comfort as regarded his chest ailment; whereas he had previously suffered at such times from continual accessions of bronchial irritation.

I must advert, for a moment, to two points in this case deserving of notice, although not bearing directly on our



present subject. The first is the peculiar character of the patient's respiration. The sounds of inspiration and expiration, instead of merging the one into the other, as they do in the normal state, were separated by a distinct pause. This rather uncommon character of the respiration is almost peculiar, in so pronounced a degree, to the advanced stage of pulmonary emphysema, from which this patient was suffering. The pause between the sounds is due, I have no doubt, to the diminished elasticity of the pulmonary tissue, retarding the commencement of the expiratory contraction upon the air contained in the air-cells at the end of inspiration. The second point is the striking degree of benefit which the patient appeared to derive from the use of tincture of larch, as regarded both the cutaneous and the pulmonary affection.

With reference to the connection between the eczema and the bronchitis in this man, I may observe that, although no history of the existence of gout in his family could be obtained, yet the occasional deposit of red sediment in his urine, and the death of a brother from asthma, together with the evident tendency of the eczema and bronchitis to alternate in severity, leave no doubt on my mind as to their common constitutional origin. Probably the presence of lithic acid deposit in the urine of this patient was an indication of some condition of system that produced both the eczema and the bronchitis. In further confirmation of this view, I may mention that I have seen other cases in which an excess of lithic acid in the urine has been associated with bronchitis, or with bronchitis and eczema. The relation appears to me so important, in a practical point of view, that I shall give you a brief abstract of two cases, from my private practice, in which an excess of lithic acid, deposited in the form of gravel, alternated with bronchitis; and, in one of the two cases also with psoriasis, in much the same way as the psoriasis alternated with bronchitis and gout in the case of Jane S., which has just been under consideration.

CASE 39.—James L., a young gentleman, aged nineteen years, consulted me, some years ago, for severe pain in the loins. His tongue was clean; appetite good; bowels regular; and, in fact, he looked and felt in perfect health, with the exception of the pain in the back. On examining his urine, however, I found that it contained a large amount of sandy deposit. Under the microscope this sand was seen to consist of minute angular crystals of uric acid. Under the use of alkaline and other appropriate treatment, including a strict regimen, the urine ceased to contain any gravel, and the patient entirely lost the pain in the back; but after a short period of comfortable health, he returned to me suffering from a mild attack of psoriasis. This complaint also yielded in a few weeks to treatment with arsenical solution, in combination with a large excess of potash; but it was in turn soon followed by a tedious attack of bronchitis, which was immediately referable, it is true, to some casual exposure; but the predisposition to which, in my opinion, lay in the constitutional condition which had in the first place caused the gravel, and in the second the psoriasis. I am further confirmed in this opinion by the fact that some months after recovery from the bronchitis gravel reappeared in the urine, though in smaller quantity than at first.

CASE 40.—The other case to which I alluded was that of Baron T., a gentleman aged sixty years, who came under my care, in April 1864, for a severe attack of subacute bronchitis, to which complaint he had long been subject in a chronic form. He had not been entirely free from cough for several years, and constantly suffered much from dyspnoea. There was a considerable degree of pulmonary emphysema, and, as might be expected in such circumstances, the illness was a tedious one. When, however, at length the bronchial irritation abated, he began to pass large quantities of uric-acid gravel. He would give me at each visit four or five parcels

of this gravel, containing from ten to twenty grains each. After a time he appeared to be cured of this ailment also, and to be much improved in general health; he had almost entirely lost his cough, and was considerably relieved from the dyspnœa. He went abroad, and I did not see him again until June 1865, when he called on me complaining of symptoms which pointed to the probability of a stone having formed in the bladder; and this proved to be really the case. Meantime his bronchitic symptoms had remained much less troublesome than for many years before. The stone was successfully crushed by Sir Henry Thompson, and the patient returned to his home abroad. His bronchitis, however, subsequently returned, and I received the announcement of his death from that disease in November 1867.

A very similar history attaches to another gentleman who was, some years ago, under my care.

CASE 41.—Mr. W. B. had been a healthy man until his sixty-ninth year, when he was found to have a stone in the bladder. His father had died of bronchitis and emphysema, but there was no history of gout in the family. The stone was successfully crushed, but some time afterwards he had an attack of lumbago, which was followed, after another interval, by ill-developed gout in the toe and instep. The winter after this last attack he became subject to chronic bronchitis, for which complaint he came under my care. But medical treatment could now only palliate his condition, and he died of bronchitis and its consequences at the age of seventy-five years.

You will by this time fully understand that the true relation, which I believe to exist between the chronic bronchitis, on the one hand, and the gout, psoriasis, albuminuria, and gravel, on the other, in the several cases I have referred to, is that they all depend upon a common constitutional state; which in one case produces gout, in another gravel, in

a third psoriasis ; or, as in the cases we have been studying, bronchitis co-existing or alternating with one or more of these ailments. These cases were all of them therefore examples of one, and that the commonest, form of secondary bronchitis.

As regards the treatment of this form of secondary bronchitis, it is obvious, from the complicated nature of the subject, that I cannot pretend to give you, especially within the limits of this lecture, any specific directions apart from the indications you cannot fail to have gathered from my own treatment of the several cases I have related. The remedies appropriate to the bronchitis, and the affections associated with it, must obviously be varied and modified from time to time, in order to meet the constantly varying conditions of different patients, or of the same patient at different times ; and this it is only possible to illustrate by means of examples, which might be infinitely multiplied if time would admit. The one essential point, towards the successful treatment of all such cases, is that you should always bear in mind the presence of a constitutional cause for the local symptoms, and not rest satisfied with directing your efforts towards the removal or alleviation of the bronchitis, but also endeavour, as far as possible, to combat the constitutional state which is the real source of the patient's disease.

## LECTURE VIII.

## BRONCHITIS AND PHTHISIS.

SECONDARY RESULTS OF BRONCHITIS—TWO FORMS OF PHTHISIS ARISE FROM BRONCHITIS; PHTHISIS FROM INTERSTITIAL PNEUMONIA, CAUSED BY THE INHALATION OF MECHANICAL IRRITANTS; POST-MORTEM APPEARANCES; FOREIGN BODIES FOUND IN LUNG TISSUE; SOMETIMES ASSOCIATED WITH TUBERCLE—PHTHISIS A SEQUEL OF CATARRHAL PNEUMONIA; A FREQUENT SEQUEL OF MEASLES AND WHOOPING COUGH; MODE OF ORIGIN OF CATARRHAL PHTHISIS; DIAGNOSIS.

GENTLEMEN,—Bronchitis very often, especially when severe or protracted, leads to various secondary consequences in the lungs themselves. Either the nutrition of the bronchial tubes becomes altered and their elasticity becomes impaired; or, the irritation spreading deeper, the connective tissue surrounding the bronchial tubes and blood-vessels becomes hypertrophied, giving rise to the peri-bronchial thickening so often seen in the post-mortem examination of persons who have long been the subjects of bronchitis; or again, spreading even more deeply, interstitial pneumonia is set up, and the alveolar wall and inter-lobular connective tissue becoming proliferated, induration or consolidation of the pulmonary parenchyma ensues. Again, when the capillary tubes are the seat of bronchitis, the inflammation may extend into the alveoli of the lungs, producing catarrhal pneumonia: an event especially likely to happen in the capillary bronchitis of children. Dismissing, for the present, any reference to bronchiectasis and pulmonary emphysema, both of which are subjects which demand separate consideration, I propose to devote my lecture to-day to the study of the causative rela-

tions between bronchitis and phthisis. In using the word phthisis I do not limit its application to cases in which tubercle is met with after death; for certainly sometimes, when phthisis has resulted from interstitial pneumonia, nothing resembling tubercle can be discovered at the post-mortem examination, unless, indeed, we agree to apply the term tubercle, as some authors appear to do, to every kind of inflammatory product found in the lungs. I employ the word rather in the sense in which it was used, more than a century since, by Dr. Cullen, the eminent Professor of the Practice of Physic in the University of Edinburgh, who, in his 'First Lines of the Practice of Physic,' defined phthisis pulmonum as 'an expectoration of pus or purulent matter from the lungs, attended by a hectic fever,' and arising from an ulceration of the lungs. Two forms of phthisis may take their origin from bronchitis: the consolidation, caused either by interstitial or by catarrhal pneumonia, may terminate in ulceration, and excavation of the lungs, with progressive emaciation.

And, first of all, as regards the form of phthisis which results from consolidation of the lungs arising from interstitial pneumonia. I have already, in a former lecture, related some cases of chronic bronchitis caused by the inhalation of mechanical irritants into the lungs. None of these cases proved fatal whilst under my care, but the existence of ulceration of the lung was demonstrated in one of them (Thomas R., CASE 22) by the discovery, on microscopical examination, of small fragments of lung-tissue in the sputum, and was unquestionably inferred in another (Edward W., CASE 23) from the physical signs and the clinical course of the illness, which I watched over the long period of three years, during which the patient was under my observation. In this latter case I was able to trace, as you may recollect, the gradual development of pulmonary consolidation and of

slowly progressive phthisis, until, when I last saw the patient, the mischief had made such progress as to place him beyond the hope of recovery. In order, therefore, to complete your view of this subject, and to illustrate what I have just said respecting the termination of interstitial pneumonia in a form of phthisis, I will now request your attention to two other cases of the same disease in its more advanced stage, which have been under my care in the hospital, and terminated fatally whilst under observation.

CASE 42.—John W., aged fifty-one years, by occupation a slate-mason since boyhood, was admitted into Founder Ward under my care on April 12, 1876. His family history was unusually good, for both his parents had lived to an advanced age, and, together with all his brothers and sisters, were still alive and in good health. He also said that he had himself always enjoyed perfect health until the preceding Christmas, when he became troubled with cough, and began to lose flesh; nevertheless, he had continued at his work until the commencement of March, about which period he began to suffer from shortness of breath, and his cough became much more troublesome, and attended by a copious dark-coloured expectoration, but not by hæmoptysis.

On admission, his voice was hoarse; pulse, 120; temperature,  $99.9^{\circ}$ ; respirations, 35. The breathing was laborious; the percussion resonance was impaired below both clavicles; the chest expanded imperfectly, especially on the right side; there was dulness on percussion in the left supra-spinous fossa. Large crepitation and bronchophony were heard below the right clavicle, and creaking sounds over the whole front of the right lung; cavernous breathing, high-toned crepitation, and pectoriloquy in the left supra-spinous and axillary regions; abundant crepitation over the whole posterior aspect of the chest. The heart-sounds were clean but feeble, and the arteries atheromatous.

He became rapidly worse, and died on the second day after admission. At the post-mortem examination, the lobes of the right lung were found to be blended together by pleuritic adhesions; the pleura covering the lung was smooth, and not notably thickened; on section, the upper lobe was in great measure consolidated, the apex, however, remaining free; the consolidated portion was exceedingly tough and fibrous, and much pigmented, so that the cut surface exhibited a granite-like appearance; several small caseous foci occurred in the midst of the indurated tissue, but most of them were evidently produced by the inspissation of intra-bronchial products, there being definite peri-bronchial fibrous sheaths around them; similar, but less extensive, tracts of consolidated tissue occurred in the middle and adjacent part of the lower lobe; the lung was in all parts of a dark slaty-black colour; great circum-vascular and peri-bronchial thickening was seen under the microscope, and also a large excess of fibrous tissue, containing small particles of black pigment, in the alveolar walls; at the margin of the consolidated tracts there was much intra-alveolar cell-accumulation, but in the central parts the alveoli were entirely obscured.

The left lung showed far more extensive changes. The pleura covering the upper lobe was converted into a tough fleshy coat, half-an-inch in thickness; this thickened pleura covered a large cavity which occupied fully three quarters of the lobe; internally, this cavity was ragged and irregular, and was traversed in all directions by bands and cords of thickened and obliterated vessels; several bronchial tubes opened freely into the cavity; the rest of the lobe was solid and resembled granite in appearance; the lower lobe presented likewise tracts of consolidated and pigmented tissue similar to those on the right side.

Nothing resembling tubercle was found at the post-



mortem examination of this patient; the very few caseous masses that were found, being situated within the bronchial tubes, had evidently resulted from the inspissation of intra-bronchial products. We had not sufficient opportunity for studying the case in its clinical aspects, and I therefore proceed to read you an outline of the other case to which I have referred.

CASE 43.—William T. F., aged thirty-eight, stone-mason, and formerly a French millstone-maker, was admitted into Founder Ward on September 21, 1865. He had considered himself a healthy man until about ten weeks before his death, though he had for twenty years been subject to morning cough attended by a scanty transparent expectoration, but not, according to his own statement, by any shortness of breath. He had taken cold eight weeks before his admission into the hospital, when his cough suddenly became much worse, the expectoration copious and muco-purulent, and he lost flesh rapidly.

On admission, his skin was cool; pulse, 78, small and compressible. The expansion of the chest in respiration was deficient, but it was equal on the two sides. The percussion resonance was impaired over the upper and anterior parts of the thorax, also over the whole left posterior side, most markedly in the supra-scapular region, and in a less degree over the right posterior side. The vocal fremitus was increased in the sub-clavicular and supra-scapular regions on both sides, and there was pectoriloquy at the left nipple. The respiration was dry and harsh, and the sound of expiration much prolonged, over the whole of both lungs; there was coarse crepitation over a limited space near the left nipple, and also occasionally, on deep breathing, in the left supra-scapular region. The heart-sounds were normal.

A few days after his admission, the expectoration contained some streaks of blood; but his appetite continued

good; his skin was cool, and his pulse quiet. On October 8 he had a severe attack of diarrhœa, and, on the following day, I found his pulse quick and feeble, his features shrunken, and his skin cold. Towards evening profuse hæmoptysis supervened, under which he rapidly sank, and died the same night.

This history told clearly that the bronchial affection had been of long standing, and that pulmonary disease was very far advanced; and both these facts were confirmed, beyond question, by the results of the post-mortem examination.

The lungs, more particularly their posterior parts, were externally much darker than usual, and were studded with black pigment patches; the anterior borders of both lungs were emphysematous; the posterior surface of the left lung, from a little below the apex to the base, was firmly adherent to the wall of the chest, but otherwise the lungs were free from adhesions; the apices of both lungs were puckered, and presented several cicatrix-like folds, around which were emphysematous bullæ.

The lower and posterior parts of both lungs were consolidated into a dense, hard tissue, of gristly consistence and almost coal-black colour, which imparted a slight feeling of grittiness on being cut through; the freshly-cut surface was remarkably smooth, and presented a somewhat mottled appearance, the black hue being diversified by irregularly-arranged lines of an iron-grey colour; the bronchial tubes, in the consolidated portions of lung, were dilated and thickened. In the lower lobe of the left lung there was a deep-seated irregular cavity, about two inches in its long diameter, the walls of which were shreddy and black. The crepitant portions of both lungs were also very dark, and studded with patches of black pigment; scattered here and there in the crepitant portions were small solid nodules, varying from the size of a split pea to that of a small bean, which, on section, were found to be pale in colour and of firm consistence.

The mucous membrane of the larger bronchial tubes was slightly injected; the bronchial glands were enlarged, very firm, and of a deep black colour throughout.

On microscopical examination of a small portion of the dense hard tissue, it was seen to consist of fibrous tissue abundantly intermixed with granular exudation-cells and with black pigment, the latter being, in some places, arranged in well-defined roundish masses, and in others in the form of fine granules; sections of the lungs, taken at the junction of the solid and crepitant portions, showed thickening of the walls of the air-cells with a deposit of black pigment in their substance; the small pale-coloured nodules, found in the crepitant portions of the lungs, had the character of chronic inflammatory exudations; they consisted of nucleated cells and nuclei, granular matter, and cells containing oil globules, interspersed with a little fibrous material and black pigment.

Microscopical and chemical examination of portions of the lungs demonstrated the presence of minute, angular, siliceous particles in considerable quantity, embedded in the lung tissue.

Here, again, you will observe that in this case nothing resembling tubercle was found at the post-mortem examination. The case was one of chronic interstitial pneumonia, ending in pulmonary consolidation, and ultimately in ulceration of the lungs. This form of phthisis differs from tubercular phthisis in its slower course, and, for the most part, in the absence of an elevated temperature. In ordinary phthisis, even whilst the patient is still able to go about his usual avocations, you will commonly find the temperature somewhat above the normal standard in the evening; on the other hand, in the class of cases now before us, the temperature is often quite normal, or is only exceptionally elevated, when inter-current attacks of catarrh supervene.

With the appearances found after death in this last case, no one could hesitate to believe that the disease had been caused by the mechanical irritation excited by the inhalation of gritty particles into the lungs, to which the patient had been exposed by the nature of his occupation. The disease had run a very slow chronic course, and whilst it had as yet given rise to no prominent symptom, it had imperceptibly brought about a condition of the lungs which rendered the first severe attack of catarrh a fatal illness. The sequence of events exactly corresponded with the history of many similar cases which have come under my observation. Such patients often suffer, during many years, from chronic cough and expectoration, without being disabled from work, excepting on the accession of the more acute catarrhal attacks, to which they are exceedingly liable. The character of the physical signs in this disease is usually quite out of proportion to the amount of discomfort which the patient experiences. I have often seen potters, needle-pointers, flax-hacklers, chaff-cutters, and other operatives exposed to the inhalation of dust, who presented all the physical signs of far-advanced phthisis, and were yet able to continue their daily labour. As regards the exciting cause of this disease I may say that the nature of the mechanical particles inhaled into the lungs appears to be of secondary consequence as regards the ultimate result, excepting that the heavier and more penetrating kinds of dust, such as angular particles of grit, produce severe disease more rapidly than the lighter kinds.

The true pathology of this disease is, that the inhalation of mechanical irritants into the air-passages sets up in the first instance bronchial irritation which gradually extends to the sub-epithelial tissues, and finally produces the consequences seen in these patients. In the early stage of the disease, if exposure to the irritant be discontinued, a complete

recovery may take place, and even in more advanced cases the further progress of the disease may sometimes be arrested.

I have spoken of this form of phthisis as a form quite distinct from true tubercular phthisis, and the cases I have related fully justify my statement, unless, as I said before, we agree to call every inflammatory product found in the lungs by the name of tubercle. I should, however, leave the subject imperfect, and you, possibly, under an erroneous impression, if I did not add that sometimes this disease is found associated with true tubercular phthisis, as you may see in the specimens upon the table, taken, the one from a potter, and the other from a stonemason, in whose lungs these tubercles appear to have been associated with the interstitial pneumonia, perhaps as a secondary lesion. On the other hand, a very similar but not quite identical condition of lungs not infrequently supervenes in the course of very chronic phthisis. Of this also I show you a specimen, taken from the body of a patient who indubitably had tubercular phthisis that ran a very slow course. The disease did not commence until after the age of fifty years, and its progress was so slow that the patient was under my care for upwards of six years. The toughness of the lung tissue, the fibrous bands which traversed it, and the hard nodules with which it was studded, all arose from the same kind of interstitial growth as that found in the slate-mason and French mill-stone-maker's lungs I have described, but the cause was different. In the one case the disease commenced as a chronic tubercular phthisis, whilst the other cases had no tubercular relations whatever, but arose from direct irritation of the lungs produced by the inhalation of mechanical particles.

I proceed next to the consideration of the much more frequent form of phthisis which occurs as a sequel to bron-

chitis. When catarrhal pneumonia supervenes upon capillary bronchitis, a copious formation of cell-products takes place in the bronchioles and pulmonary alveoli. These products may be expectorated as they are formed, and complete recovery follow; but the difficulty of dislodging them by the act of coughing, when in large quantity, is so great that they are apt to accumulate in their original site, more or less completely blocking up the alveoli and bronchioles. The deposit thus formed, like other products of inflammation, is very prone to undergo degeneration, and, softening down, may still be entirely removed by expectoration or absorption without serious injury to the pulmonary structure. In other cases again, the recovery is less complete, and some damage to the lung is left, especially if, as often happens, collapse of individual lobules preceded the development of broncho-pneumonia. Little firm nodules are now found, after death, scattered throughout the affected lung-tissue. These often undergo caseous metamorphosis, and when of small size may dry up, shrivel, undergo the process of cretification, and remain quiescent for an indefinite time, or even, it may be, for life. In many cases, however, none of these results follow; either the deposit is originally more extensive, or neighbouring deposits, undergoing caseous transformation, coalesce and form tracts of caseated tissue sufficiently extensive to afford physical evidence of their presence. It is still, nevertheless, possible that the deposit may soften down and be removed, and recovery may take place, leaving the lung in a comparatively healthy condition. It is probable that most of the cases of cured phthisis on record belonged to this class. I have seen signs of pulmonary consolidation clear away perfectly, and the respiration regain its normal or almost normal condition, in cases which had at one time a very threatening aspect. Such a case was under my care in Murray Ward three years ago, and I cannot give you a

better illustration of such recovery from a very unpromising state.

CASE 44.—Julia C., aged forty years, a married woman, was admitted on April 7, 1875. We could not learn anything definite respecting her family history, but the patient herself had upon the whole enjoyed good health. She had borne seven children in the course of fifteen years. After one of her confinements, six years before her admission, she had been laid up for a month with rheumatism; from this she recovered perfectly, and had remained well until January 1875, when she caught cold after recovering from another confinement, and again suffered from rheumatic pains in most of her joints, but unattended by redness or swelling: she also suffered from shortness of breath and cough. She soon lost the pains, but the cough continued, and she emaciated greatly; she also had profuse night-sweats, especially about the head.

On admission, the pulse was 136, feeble and irregular both in force and rhythm; temperature,  $100\cdot2^{\circ}$ ; respirations, 36; she was very thin; the tongue was much furred. The chest expanded imperfectly on the right side, on which side also the percussion resonance was markedly impaired from the clavicle to the fourth rib; a few faint crackles were heard in the upper part of the right lung; dry bronchitic sounds over the rest of the front of both lungs. The percussion resonance was likewise impaired over the right supra-clavicular region, and was not quite clear immediately below the spine of the scapula: over the rest of the back it was normal; rhonchus and sibilus and abundant moist crepitation were heard over the back of both lungs, larger crackles were heard in the right supra-spinous fossa. The cough was troublesome, and the sputum was copious, frothy, and contained some yellowish opaque streaks, and also some greenish-

coloured nummular masses floating in the frothy fluid. The urine was normal.

On the day of admission she was ordered a draught with tincture of squill and syrup of poppy, to be taken every six hours. She was put upon broth diet, with eggs and milk; and 2 ounces of brandy to be administered in divided doses during the day.

For several days the temperature kept above the normal. It ranged from  $98.8^{\circ}$  to  $99.4^{\circ}$  in the morning, and from  $101.0^{\circ}$  to  $102.6^{\circ}$  in the evening until April 21; from which date it became normal. The pulse continued to range from 120 to 130 until the temperature fell, when it also fell to about 90.

The cough continuing troublesome, I ordered her to take the hospital linctus, containing syrup of squill, morphia, and hydrocyanic acid, occasionally; and, on the second day after admission, substituted the nitro-hydrochloric acid draught with a drachm of cod-liver oil, twice a day, for the previous medicine. She also had a pill with morphia and hemlock at night.

On April 21 her aspect was greatly improved, the cough much less frequent, and the sputum scanty but still of the same nummular character; the breath-sounds were generally improved, but the crackling and harsh breathing were still heard below the right clavicle. The dose of cod-liver oil was now increased to  $\frac{1}{2}$  an ounce twice a day.

She was discharged at her own request on May 20, being in all respects improved. She had gained flesh very considerably, the cough was now slight, and the expectoration had almost ceased; the breath-sounds were good over the chest generally, but the breathing was tubular below the right clavicle and in the right supra-spinous fossa; the percussion resonance was also normal everywhere, excepting over



the apex of the right lung, and, even in this situation, the dulness had much decreased.

Some of you may, perhaps, recollect a woman who was in Murray Ward last winter, who, also, had catarrhal pneumonia in the course of a severe attack of typhoid fever. She presented all the signs of pulmonary consolidation. There was greatly impaired percussion resonance under the clavicle, with harsh breathing, coarse crepitation, and exaggerated vocal resonance and vibration. Contrary to my expectation she gradually, though slowly, recovered, and ultimately left the hospital quite well.

In another class of cases, the broncho-pneumonia becoming chronic, the walls of the alveoli become diseased, either by reason of the intensity of the inflammation, or because the deposit with which they are choked interferes with the capillary circulation; their nutrition becomes impaired, and breaking down of the consolidated portion of the lung ensues, with excavation and the formation of phthisical cavities.

Even in this latter class of cases, however, unless the disease be very extensive, recovery is not impossible. I have lately seen a patient in whom this fortunate result appears to have taken place. His history is briefly as follows.

CASE 45.—A gentleman, aged fifty-three years, first consulted me in May 1876. He had never been robust, and had suffered from a severe attack of catarrh in the preceding January, which, in the following month, developed into a chronic bronchial affection with loss of voice. When I saw him he was dyspeptic and in feeble health, he also complained of frequent cough accompanied by a yellow expectoration. The chest expanded about equally on the two sides, but the percussion resonance was slightly impaired, and the vocal vibration increased below the right clavicle; on auscultation, scanty crackling and increased vocal resonance

were audible in the same situation; the pulse was only 82, and the temperature in the forenoon  $100\cdot0^{\circ}$ ; his voice was hoarse, but there was no appreciable dyspnoea. I recommended him to paint tincture of iodine over the dull space below the clavicle, and prescribed iodide of potassium in combination with citrate of ammonia and iron, and also a slight sedative to alleviate the cough. He subsequently also took cod-liver oil.

The amendment was very slow, and as in the autumn there still remained some degree of crackling in the apex of the right lung, I advised him to pass the winter in a warmer climate. He returned home in the following June much better, but not altogether free from cough, and the breathing was still harsh, and slight crackling was still audible after coughing in the original site. He improved during the summer, and was able to spend last winter at home. He called upon me on the 8th of the present month of May (1878) on account of some dyspeptic symptoms, and I then found good resonance over the previously dull area. The voice-sounds were a little too intense, but neither crackling nor any other abnormal sound could be detected in the seat of the former mischief.

Catarrhal pneumonia is a frequent sequel of measles and whooping-cough. The bronchitis which almost always accompanies these diseases, either on account of inattention to avoid exposure or of the feebleness of the patient, creeps into the capillary tubes and thence into the pulmonary alveoli. We have recently had two cases in Founder Ward in which this occurred. In one of them the pneumonia supervened under our observation, the other patient only came under my care several months after the acute stage had passed over. I take first the case of a boy who was so far recovered as to be sent to a convalescent hospital a few days since.

CASE 46.—Charles W., aged five years, an ill-nourished, strumous-looking child, was admitted on March 16, 1878. He had been ailing for about three weeks with loss of appetite and cough, to the latter of which he had been subject from infancy. Three days before admission diarrhœa had supervened, and still continued.

On admission, the little patient had a frequent, harsh cough, and complained of pain in the left mammary region; the temperature was  $102.6^{\circ}$ , the pulse, 128, and the respirations, 38; the tongue was moist, coated on the dorsum with a creamy fur, red at the tip and border; eyes suffused; cheeks flushed; at either angle of the mouth there was a small patch of herpes. The percussion resonance was normal over the chest; some moist crepitation was audible in the posterior base of the left lung, otherwise the breath-sounds were everywhere quite healthy. The abdomen was slightly distended, and the patient lay upon his back with the knees raised, but neither gurgling nor tenderness on pressure could be discovered.

He was ordered to take a dose of the hospital common cough linctus occasionally, and a draught with solution of acetate of ammonia every six hours.

In the evening the temperature had risen to  $103.6^{\circ}$ , the pulse to 152, and the respirations to 50 in the minute.

The fever was of remittent type. The temperature fell daily in the morning to a point ranging from  $99.0^{\circ}$  to  $100.4^{\circ}$ , and the pulse to 120, but both rose again in the afternoon: the temperature on March 17 to  $105.2^{\circ}$ , and on subsequent days to about  $103.0^{\circ}$ , the pulse to a frequency varying from 132 to 156. The breathing also continued frequent, the respirations ranging from 35 to 50 in the minute; the urine was normal, but of rather low specific gravity; the patient was very drowsy, his face continued flushed, and the pupils were dilated; the abdomen was

rather tympanitic, and, on several occasions, gurgling was found in the right iliac fossa; but there was no pain there, and the stools were always pultaceous and of normal colour. No history of exposure to any contagious disease having been discovered, I for two or three days thought the case might turn out to be one of typhoid fever.

On March 19, three days after admission, the cough continued troublesome; crepitation was still present in the lower lobe of the left lung, and dry bronchitic sounds were heard over the chest; the percussion resonance was normal everywhere; the child was drowsy and restless, and had vomited; the temperature was  $104.0^{\circ}$ ; pulse, 156; respirations, 34. Next day crepitation was heard all over the front of the left lung, and the vocal resonance was intensified below the corresponding clavicle.

On March 21, the eruption of measles appeared, and the temperature fell to  $100.6^{\circ}$ ; the pulse, however, remained high, being 155, and the respirations, 48; the breathing was laborious; there was marked recession of the lower intercostal spaces during inspiration; the cough was frequent and abortive, and moist crepitation was heard over the lungs both before and behind. The child still lay upon his back with the knees raised, and the abdomen was large and tympanitic.

To take every four hours a draught containing  $\frac{1}{2}$  a drachm of solution of acetate of ammonia, 3 grains of carbonate of ammonia, 1 drachm of syrup, and 3 drachms of water. A dessert-spoonful of port wine was also ordered to be administered every six hours.

For several days little change took place. The pulse ranged from 132 to 156, and the respirations from 38 to 52; the temperature, however, was lower, and varied from  $98.0^{\circ}$  to  $101.4^{\circ}$ ; the cough continued frequent and distressing, and crepitation was audible all over both lungs; the tongue

continued furred, and sordes formed on the teeth and gums.

Thus far, the case was only a severe one of measles in a delicate subject who had been previously liable to bronchial affection. Indeed, when the patient came into the hospital, and before the nature of the case had become clear, he was suffering from bronchitis of the lower lobe of the left lung, which had evidently arisen from cold, for the child had been ailing too long to justify us in considering his indisposition as the onset of measles. The existence of herpes at the angles of the mouth lends, if need be, additional support to this view. The more generally diffused bronchitis only occurred with the development of measles, of which disease, in fact, it formed a part. As usual in measles, the fever abated so soon as the rash came fully out, but the defervescence was less complete than usual, the fever being kept up by the more than usually severe bronchitis which accompanied the disease.

And now consolidation of lung took place, whether preceded by lobular collapse or not is doubtful. The temperature, which had been almost normal, rose again, though not to so high a point as it had reached before the rash of measles appeared. The following note was taken on March 27.

Percussion resonance impaired over the lower posterior base of the right lung; temperature,  $98.8^{\circ}$ ; pulse, 126; respirations, 40; the patient is very restless, and the cough troublesome but abortive. Next day the temperature had risen to  $101.4^{\circ}$ , the pulse to 148, and the respirations to 52.

On March 31, there seemed to be some improvement, but there was still some dullness on percussion over the posterior base of the right lung; the cough was very troublesome, and crepitation was still audible all over both lungs: it was larger in the bases and smaller in the upper parts of

the lungs; the temperature on the morning of this day was only 97·2; the pulse was 132, and the respirations 48; in the evening the temperature was 100·0°, the pulse 124, and the respirations 56.

He was now ordered to take  $\frac{1}{2}$  a grain of sulphate of quinia with 2 minims of diluted nitro-hydrochloric acid, 20 minims of syrup of ginger, and  $\frac{1}{2}$  an ounce of water three times daily, together with 1 drachm of cod-liver oil.

The improvement was very slow; the cough still continued to recur in distressing paroxysms, but the dulness at the base of the right lung gradually disappeared and the crepitation decreased. On April 4, a patch of dulness on percussion was detected near the lower dorsal vertebræ on the left side; the crepitation had disappeared from the upper lobes and front of the chest, but still continued abundant and large in the posterior bases of both lungs; the temperature now ranged from 98·0° to 101·0°; the pulse from 114 to 140, both being higher in the after part of the day.

On April 9, large moist crepitation still continuing, without material change, in the lower lobes of the lungs, I prescribed 5 grains of alum, with  $\frac{1}{2}$  a drachm of syrup of tolu, and  $\frac{1}{2}$  an ounce of water, to be taken every six hours, and increased the dose of cod-liver oil to 2 drachms.

April 13.—Pulse, 116; morning temperature, 98·6°, evening, 99·4°. There still remained marked impairment of resonance at the base of the left lung, close to the vertebræ; but the breath-sounds were improved, and there was much less crepitation.

The improvement was henceforward steadily progressive. On April 25 it was noted that, though still much emaciated, the general aspect of the boy was greatly improved, and that his appetite was good. There was still slight cough, and the dulness, at the base of the left lung, remained without material change; but the breath-sounds were fairly normal

over the whole of both lungs; pulse, 100; temperature, 98·0°. He was now up and about the ward all day, and was sent to a children's convalescent hospital on May 5.

The boy has left us in fair health, but with some consolidation of the lower lobe of the left lung. Probably this commenced with collapse of some of the individual lobules in that situation, and, if so, the consolidation is not now likely to pass away. It is not very extensive, and may, perhaps, prove unimportant. The boy's prospects are, however, not very promising; a delicate strumous child, subject to catarrh, who has once had capillary bronchitis being very likely indeed to have future attacks of the same kind.

The other case to which I referred is still under my care. He only came under observation when the disease had already lasted for a considerable time and had become established. I was absent for a few days when the patient was admitted, and quote the notes on admission taken by Dr. Coupland.

CASE 47.—Richard C., aged nine years, was admitted into Founder Ward on April 20, 1878. A brother and sister of the patient's had died of whooping-cough and convulsions, and several maternal relatives of lung disease. About a year ago the patient had suffered from measles, since which time he has never been well, and has had constant cough. Three weeks since this cough became much aggravated, and he spat up some blood-stained phlegm; he has also perspired at nights, and has emaciated. On admission, the pulse was 112; and the temperature, 98·8°; the tongue was furred, and the cough troublesome. The chest was slightly flattened, and the expansion deficient below the left clavicle; the percussion-note was high-pitched and tympanitic from the left clavicle to the third rib, below which point there was dulness merging into the cardiac dulness; the percussion resonance was likewise high-pitched in the upper part of the axilla and over the left

supra-spinous fossa, and greatly impaired over the upper two-thirds of the back of the thorax; a clear pulmonary note was yielded by the right side of the chest both over the front and back. On auscultation the breathing was puerile and exaggerated over the right lung; harsh tubular breathing, scanty high-toned crepitation, and bronchophony were audible in the left infra-spinous fossa; the breathing was almost cavernous, and the vocal resonance pectoriloquous in the left supra-spinous fossa. The heart-sounds were normal but extensively diffused; the area of liver dulness was also normal; there were no enlarged lymphatic glands.

To take the common linctus occasionally when the cough is troublesome, and 1 drachm of cod-liver oil twice a day; tincture of iodine to be painted over the left infra-clavicular and scapular regions.

April 21.—Urine, sp. gr. 1018, normal; boy perspired much last night; temperature in the evening,  $98.2^{\circ}$ ; pulse, 92; the cough having been very troublesome, a draught, containing 5 minims of compound tincture of camphor, 1 drachm of syrup of tolu, and  $1\frac{1}{2}$  drachm of cinnamon water, was substituted for the linctus. The temperature remained about the normal standard, and the pulse ranged from 90 to 118 until April 25, when I took charge of the patient.

April 25.—Temperature,  $98.3^{\circ}$ ; pulse, 90. Dulness on percussion over the left front of chest from the clavicle to the mamma; breathing feeble and of blowing character; well pronounced vocal resonance over dull area; no adventitious sounds; expansion imperfect below the left clavicle. Breathing very harsh at the outer angle of the right clavicle, with marked increase of vocal resonance. High-pitched dulness in left supra-spinous fossa; faint crackling in left supra-spinous and infra-spinous fossæ. The dose of cod-liver oil to be increased to 2 drachms.

April 30.—The temperature rose last evening, for the



first time, to  $100.4^{\circ}$ ; pulse, 114; cough more troublesome. High-pitched tympanitic resonance below the left clavicle and in the left supra-spinous fossa; percussion resonance much impaired over the whole upper part of the left back of thorax, and in front, from the second rib downwards, merging into the cardiac dulness. Breath-sounds tubular below the clavicle; vocal resonance greatly increased on left side, especially just above the nipple; no adventitious sounds are heard in front; tubular breathing, scanty crackling, and well-marked bronchophony in the left supra-spinous fossa.

May 13.—Resonance still much impaired below the left clavicle and in the left supra-spinous fossa; breathing harsh, generally, over the left lung and partially over the right one also; no adventitious sounds in either lung.

May 29.—The general aspect of the child is very greatly improved; he has gained flesh, and is quite free from cough; the percussion resonance is, however, still impaired from the left clavicle to the mamma, more particularly below the second and third ribs; there is also deficient clearness of note in the left as compared with the right supra-spinous fossa. The inspiration is harsh; the expiration inaudible below the left clavicle; the expiration is prolonged and very distinct below the right clavicle. In the left supra-spinous fossa, the breathing is markedly harsh, and the vocal resonance exaggerated. On forcible breathing slight sibilus is heard in the apex of the left lung, but on the most careful examination no other adventitious sound is anywhere audible. It is evident that no disorganisation of the lung has taken place, and the boy is now about to be discharged in fairly good health.

Catarrhal pneumonia, like its usual forerunner, capillary bronchitis, when it attacks lungs previously free from organic disease, is more frequent in early than in later life, when other consequences, such as pulmonary emphysema, more

commonly follow the extension of catarrh into the smaller bronchial tubes. Nevertheless, we do sometimes meet with catarrhal pneumonia at even an advanced period of life, a fact of which I will now request your attention to an example.

CASE 48.—Jane K., aged fifty-six, a needlewoman by occupation, was admitted on March 14, 1877. She stated that, until the previous winter, she had enjoyed uninterrupted good health, having no recollection of ever having been ill. She had, indeed, occasionally suffered from colds and cough like other people, but never for any continuance. About three months before presenting herself at the hospital she had caught cold, and began to cough and expectorate. Her appetite had also failed, and she began to lose flesh. Had not suffered from any pain in the chest, neither had she spat blood. At the beginning of her illness she had no difficulty of breathing, but latterly she had experienced shortness of breath.

On admission, temperature,  $98\cdot0^{\circ}$ ; pulse, 104; respirations, 36; tongue furred. Below the right clavicle, the percussion resonance was impaired, the breath-sounds were divided, and expiration was distinct and prolonged. Dry and moist râles were heard all over the front and back of both lungs. The vocal resonance was slightly exaggerated in the right supra-spinous fossa. Urine normal. To take the hospital linctus of morphia, syrup of squill, and hydrocyanic acid occasionally, and to inhale 1 drachm of the oil of *pinus sylvestris* three times daily, with the steam of hot water.

March 15.—Cough troublesome; sputum abundant, liquid, frothy, and of a yellow colour; pulse, 102; respirations, 30; temperature,  $98\cdot8^{\circ}$ , in the forenoon,  $100\cdot0^{\circ}$  in the evening.

During the following week there was little change; the pulse and respiration varied little, and the temperature never

exceeded  $99\cdot0^{\circ}$ , and was more frequently from  $97\cdot0^{\circ}$  to  $98\cdot0^{\circ}$ , in fact rather under than over the normal standard.

March 21.—Rather high-toned crepitation was this day heard below the right clavicle and in the right supra-spinous fossa, and the vocal resonance was decidedly bronchophonic in the same situations; no moist sounds were now heard in the left lung excepting in the posterior base, but dry bronchitic râles were audible over the back of that lung.

March 29.—Only slight crepitation was heard on this day, below the right clavicle; rhonchus and sibilus were heard over the upper parts of both lungs, and crepitation in the posterior bases; sputum muco-purulent and scanty; cough much less troublesome.

From this time the patient appeared to be progressing well, until April 29, on which day she complained that she did not feel so well, and that her cough had become more severe. Next day she had a slight attack of hæmoptysis, which recurred for a day or two, without any material change in the physical signs. From this time, however, she gained ground steadily, and was discharged towards the end of May in much improved condition, the bronchitis having cleared away and the cough greatly subsided, but there still remained impairment of percussion resonance over the apex of the right lung, and slight cough.

I would beg to direct your attention to the occurrence of hæmoptysis in this case, and to the fact that the patient improved more quickly afterwards. I have noticed the same fact in other cases, and though it would be very rash to look upon the supervention of blood-spitting in such cases as otherwise than a grave incident that demands the watchful care of the physician, since it may indicate breaking down of the consolidated lung, and be the precursor of excavation, one can, yet, readily understand that it may, sometimes, be useful in relieving over-loaded and congested vessels.

Both these last cases were cases of chronic consolidation of the lungs due to catarrhal pneumonia. The probable history of such cases, as I have already explained, is that the catarrhal products over-crowding the alveoli of the lungs, being neither expectorated nor absorbed, dry up, and form the caseous infiltration one sees after death in similar cases. If not too extensive, this condition may continue dormant for many years, or, it may, at a later period, form the centre or focus from which tubercular infection may arise, and thus lead either to the development of true tubercular phthisis, or to acute general tuberculosis.

Most of you would probably have diagnosed these two last-described cases as cases of phthisis, and they may indeed be truly said to have been cases of that disease in its first stage. In order to avoid misconception, however, I have preferred calling them cases of chronic catarrhal pneumonia with consolidation of lungs. The disease was not actively progressive; the temperature was not elevated; and no destructive process appears to have been going on in the lungs of either patient. There was in fact no ulceration of the lungs, hence one of the essential factors of phthisis, as defined by Dr. Cullen, was wanting. There is, however, but a step between such cases as I have now described and other cases which we should all agree to call phthisis, but it is a step marked by no definite boundary line. The difference is but one of degree; of wider or narrower extension of the disease; or of greater or less intensity of the inflammation. If the catarrhal pneumonia be of moderate severity, and does not involve an extensive area of the lung, it may either clear away, without becoming chronic, or becoming chronic, obsolescence may take place, and the consolidated lung-tissue occasion no further present inconvenience. On the other hand, if the pneumonia invade a large area of the lung-tissue, or be very severe in the acute stage, the walls of the air-cells,

and even, perhaps, the interstitial tissues, may become affected, and their nutrition modified by the inflammatory process. A wider extension of the pneumonia will also, by obstructing expectoration and absorption, favour the retention of the catarrhal products in the alveoli and bronchioles. The accumulation of these in the alveoli, especially if extended over a considerable area, must interfere with the circulation and, of course, the nutrition of their walls. This, and the implication of these same walls, and possibly of deeper structures in the inflammatory process, will render them liable to participate in any degenerative change that the catarrhal exudation may undergo. Not unfrequently the exudation softens and, together with the degenerated lung tissue involved in it, breaks down, and ulceration of the lung becomes established. This condition may be diagnosed by the physical signs and constitutional symptoms, of the latter of which fever forms the most prominent symptom. In such cases you will often, on a microscopical examination, find shreds of elastic pulmonary tissue in the sputum, an unerring evidence of the existence of ulceration of the pulmonary parenchyma.

In order to complete this subject, I must read the notes of a case in a more advanced stage.

CASE 49.—Morris K., a police constable, aged twenty-five years, was admitted into Founder Ward on November 24, 1876. His parents and five brothers and sisters were all alive and in good health. With the exception of an occasional cold, after exposure to bad weather, the patient himself had also been a healthy man. Two months before coming to the hospital, he had caught cold, after a heavy night's duty, and had suffered from cough, and been laid up for five weeks. His cough had been very troublesome, and was frequently attended by vomiting; the expectoration was thin and frothy, and had never been tinged with blood.

His breathing had been short and difficult, but unattended by pain ; he had sweated profusely at night.

At the expiration of five weeks, feeling much better, he had resumed his duty, but again took cold at the end of three weeks ; the cough, which had never altogether left, returned with its original severity, and again compelled him to give up duty. He said that he had lost much flesh, and was decidedly emaciated when he came under my care.

On admission, the temperature was  $102.4^{\circ}$  ; the pulse, 108. The right side of the chest expanded much less fully than the left, and there was considerable flattening below the clavicle ; the percussion note was dull at the upper part, and impaired all over the front of the right lung. The breathing was cavernous and large, high-toned crepitation and bronchophony were heard below the right clavicle. The percussion resonance was also greatly impaired, and harsh breathing and coarse moist sounds were heard over the back of the right lung. The breathing was also harsh, and dry wheezing sounds were heard over the front of the left lung, and large creaking crepitation was audible in the posterior base of the same lung. The vocal vibration and resonance were everywhere much more intense over the right than over the left lung. The sputum consisted of a clear mucus, in which opaque, yellow-coloured, nummular masses floated. The urine was perfectly normal. The treatment prescribed was iodide of potassium, tonics, and sedatives ; but, although the cough was greatly relieved, there was no improvement in the general condition of the patient ; the temperature kept up, being for the most part about two degrees higher at night than in the morning. The disease had evidently advanced too far before his admission into the hospital to leave any chance of material improvement.

On December 11, he complained of pain and tenderness along the margin of the ribs, and of lancinating pain in the

right side of the chest when he coughed ; the breathing became markedly tubular below the right nipple, but no pleuritic friction could be discovered ; loud amphoric breathing and whispering pectoriloquy were now heard over the back of the right lung ; his breathing became rapid and distressed, and he gradually sank, and died on December 16.

At the post-mortem examination, the right lung was found retracted, and adherent to the back of the thorax ; the right pleura was thickened, opaque, and covered with shreds of a yellow-coloured lymph ; the pleural cavity contained 18 ounces of straw-coloured, flaky fluid, and communicated by a ragged opening, large enough to admit the tip of the index finger, with a cavity in the apex of the lung.

On section, this lung was found to contain several cavities varying greatly in size ; two of the largest, each the size of a walnut, were situated in the upper lobe ; one of these communicated with the pleural cavity, as above mentioned ; in the lower lobe the cavities were of smaller size and not very numerous. The contents of the cavities were broken-down cheesy deposits, and caseous tracts and nodules formed the main part of the solid portion of the lung. The left lung was attached to the wall of the thorax, posteriorly, by a few old adhesions ; on section, the bronchi were found to be filled with a thick secretion, and the greater part of the lung was œdematous ; the lower half of the upper lobe was studded with caseous deposits, which were in process of softening ; there were, also, a few of these masses scattered through the rest of the lung ; the other organs were all healthy.

Observe, with regard to this case, the rapid progress and wide extent, and also the absence of any hereditary element in the causation of the disease. The fatal illness originated in what the older physicians would have termed, and correctly termed, a neglected cold. Possibly, if the man had remained under good treatment at the time when he resumed his duty,

he might have completely recovered. The case was one of pulmonary consumption in the proper sense of that word, but it was not one of tubercular phthisis; the lungs contained, indeed, abundant relics of inflammatory products, in the form of catarrhal cell-growth and pulmonary parenchyma, which had undergone caseation and destructive softening, but there was no true tubercle. In fact, the patient had only reached an ulterior stage of the same disease which I have described in the two former cases; in them the mischief stopped short of the destructive process of ulceration; in him that process was consummated.

The cases I have brought before you to-day show very well the character of many of the cases of phthisis which you will meet with in practice; and it is very important that you should, if possible, recognise them at their earliest stage, when it is still possible that judicious treatment may arrest their further progress. One very important lesson may be derived from their consideration—it is, never to treat bronchial catarrh too lightly. It may, when first observed, be unimportant in itself, but bronchial catarrh is always liable to spread downwards in the direction of the capillary tubes, and this is especially true of delicate, ill-nourished persons of feeble stamina. The progress of the catarrh into the smaller tubes is often most insidious, and may readily be overlooked for a time, unless the patient be closely watched. In young persons, more especially, the temperature should be taken at least once a day, in every case of severe catarrh, for a rise of temperature rarely fails to take place when the catarrh invades the alveoli, as did, in fact, occur in the boy Charles W., whose case was the first I narrated to-day. And, again, observe that the phthisis is a secondary disease, and does not usually, if ever, come into the field until the acute stage has passed over. It is a result of the catarrh, and not, so to speak, an integral part of the catarrhal process.



The prognosis of this form of phthisis is much more hopeful than that of true tubercular phthisis. Catarrhal phthisis may become arrested, often for a considerable time, sometimes, in an early stage, permanently, whereas I regard true tubercular consumption as always a more or less rapidly progressive disease. The differential diagnosis of the two diseases is not usually difficult. Both of them, it is true, are apt to begin insidiously, but catarrhal phthisis commences with a definite attack of catarrh, in many cases referable to a certain cause, which merges into the subsequent phthisis; whilst tubercular phthisis is, commonly, preceded by disturbance of the general health, debility without obvious cause, and at least some amount of fever and emaciation; and these symptoms often precede the access of cough and expectoration. Even when these latter symptoms do direct attention to the lungs, the physical evidences of disease in those organs are frequently insignificant and out of all proportion to the severity of the constitutional condition of the patient. On the other hand, in catarrhal phthisis, there are very obvious signs of bronchial disease from the very commencement of the illness. In making these remarks, I am not unmindful of the fact, that tubercles sometimes become developed, as a secondary lesion, in the course of chronic catarrhal phthisis; thus justifying, with regard to it, the very striking assertion of Niemeyer that 'the greatest danger to most phthisical patients is the development of tubercles.'

## LECTURE IX.

## BRONCHIECTASIS.

PHYSICAL SIGNS RESEMBLE THOSE OF PHTHISIS—DIAGNOSIS FROM PHTHISIS—POST-MORTEM APPEARANCES; DILATATIONS INCREASE TOWARDS PERIPHERY OF LUNG; DIFFERENT FORMS OF DILATATION; TUBULAR; SACCULAR—BRONCHIECTASIS A SECONDARY DISEASE; OFTEN RESULTS FROM BRONCHITIS—SPUTUM; NUMMULAR; OFTEN FETID—MECHANICAL CAUSES OF BRONCHIECTASIS; ALTERED NUTRITION OR DEGENERATION OF BRONCHIAL TUBES; IMPEDED MOVEMENT OF LUNGS IN RESPIRATION; IMPEDED EXPECTORATION AND BLOCKING OF TUBES WITH INSPISSATED MUCUS.

GENTLEMEN,—I propose to take as the text of my lecture to-day, the case of a man who recently occupied bed No. 20 in Founder Ward. He was indeed a very short time in the hospital, for he died on the third day after admission, but not before we had ascertained the chief features of his case, and formed a correct diagnosis of its nature.

CASE 50.—The patient, Joseph P., was admitted into the hospital, on February 27, 1876. He was a labourer by occupation, and stated his age to be fifty years, but looked full ten years older. There was no history of phthisis, nor of any other special ailment, in his family, excepting that his mother had died of bronchitis at an advanced age. His occupation involved much exposure to vicissitudes of weather, and to this cause he attributed a great tendency to colds and coughs, from which for the last ten years he had rarely been long exempt. He stated that, five years before coming under my care, he had been in King's College Hospital, under the care of Dr. Beale, for broncho-pneumonia, and that since that

time he had suffered more or less from cough and shortness of breath.

Six weeks before presenting himself at the Middlesex Hospital, he had had one of his accustomed attacks of catarrh, which, beginning in the nasal passages, ended in a severe cough attended by a very abundant expectoration. He had contended against this ailment for four weeks, but was at length compelled to give up his occupation; his cough daily becoming worse, and the shortness of breath increasing so much that he was unable to lie down in bed.

On admission, his pulse was 90, but the temperature was slightly below the normal standard, being only  $98.0^{\circ}$ . On exposing the chest for examination, it was seen to expand imperfectly and unsymmetrically, the expansion being most deficient on the left side, which also lagged in movement, slightly but obviously, behind the right side. The resonance on percussion was clear over both the anterior and posterior aspects of the chest. On auscultation, bronchitic cooing sounds were heard, more or less generally, throughout both lungs. There was abundant large crepitation in the posterior bases of both lungs, and also in the left mammary region. The vocal resonance was unnaturally loud over the greater portion of the lower lobes of both lungs, and the breath-sounds in the base of the left lung were hollow and cavernous. The area of cardiac dulness was small; breathing was heard over the præcordia; the impulse of the heart was feeble, and its sounds were a little rough, but there was no definite murmur. There was orthopnœa; the face was slightly livid; the finger-ends were bulbous; the cough was frequent and paroxysmal. The sputum was liquid, muco-purulent, and exceedingly copious, and contained many nummular masses. The urine, which was of rather high specific gravity, deposited red lithates on cooling, but was otherwise normal.

The very large, high-toned crepitation, the cavernous

breathing, and marked bronchophony, all pointed to the existence of a cavity, or rather of several cavities, in each lung; and the slower and less perfect expansion of the left side plainly indicated that the left lung was more seriously diseased than its fellow. Of the existence of bronchitis there was no doubt, but the question which most prominently suggested itself for solution was whether these cavities were or were not due to phthisis. On the one hand, the impaired expansion and unsymmetrical movement of the chest in breathing, showing a decreased capacity for the admission of air, and a different condition in this respect of the two lungs, together with the physical evidence of the existence of cavities in those organs, lent support to the idea of phthisis; but on the other hand, the absence of dulness or of any other modification of the resonance on percussion, and the situation of the cavities near the bases instead of near the apices of the lungs, as well as the entire absence of fever, were all circumstances opposed to the supposition of the case being one of phthisis. Even when there are large cavities in phthisical lungs, these are always surrounded by consolidated tissue, or by dense walls which modify the percussion note. But, in this case, no such modification could be detected, and we were, therefore, able to determine the absence of any appreciable consolidation in the lungs, and to conclude from this fact, and from the other features of the case, which I have just summed up, that the cavities were not phthisical.

Still, knowing as you well do, how difficult it often is to diagnose phthisis with certainty in lungs which are at the same time the seat of extensive bronchitis, especially if there be also emphysema, you could not be surprised that I should have hesitated to form a perfect diagnosis on the first day; nor until we had learned the man's history, and had had the opportunity of seeing the expectoration. On the following day, however, the absence of any accession of fever in the

previous evening, and the character of the sputum, which I have already described, taken in conjunction with the situation of the cavities, and with the want of any evidence of consolidation of lung tissue, enabled me to diagnose the case with much confidence as one of bronchiectasis, or dilated bronchial tubes. This diagnosis was further confirmed by the fact that there was little or no emaciation, and that the general aspect of the patient was quite unlike that of a phthisical person. On the other hand, there was in this case no fetor either of the patient's breath or sputum, a very usual symptom of bronchiectasis, and one which you will recollect was very marked in two other cases which were under my care last winter, causing both great distress to the patients themselves, and much annoyance to the other inmates of the ward.

To return, however, to the case before us: the feeble impulse of the heart, and the encroachment of clear pulmonary percussion resonance upon the normal region of cardiac dullness, led me to conclude that vesicular emphysema was also present; and we accordingly wrote on the bed-card as our diagnosis, 'Bronchitis, bronchiectasis, and emphysema.' The patient was suffering so much from dyspnoea, that I ordered him to inhale the vapour of turpentine and boiling water, and prescribed a stimulating draught, to be taken every four hours, containing  $\frac{1}{2}$  a drachm each of aromatic spirit of ammonia, spirit of ether, and syrup of tolu, in 10 drachms of water. In addition to this, I ordered him  $\frac{1}{2}$  an ounce of brandy every three hours. The man was, however, almost dying when he came into the hospital; the lividity of the face increased, he became unable to expectorate, and died on March 2.

In the absence of Dr. Coupland, the post-mortem examination was made, in my presence, by Mr. Bellaby. The lungs were found projecting forwards, still in a state of inspiratory expansion. They were carefully examined by slitting open the bronchial tubes, beginning from the bifurcation of the

trachea, and tracing their course downwards towards the bronchioles. On laying open the left bronchus, and following its divisions into the substance of the lung, the mucous membrane of the larger tubes was seen to be of a dirty brownish-red colour, and, in some places, rough or granular looking; the membrane was covered with a tenacious mucus, more or less blood-stained, and in some places so abundant as to fill up the tubes. On removing this secretion, the longitudinal fibrous bands appeared to be very prominent; here and there were small ecchymosed patches of a darker hue than the surrounding membrane. The majority of the smaller tubes were found to be dilated, their calibre gradually increasing, instead of diminishing, as they receded from the main bronchus, so that the dilatations became more marked as the periphery of the lungs was approached. The dilatations of the smaller tubes were not uniform, but in many places presented, when laid open, a sacculated appearance; in other situations the dilatations continued to increase more evenly towards the end of the tube, and then terminated abruptly in a rounded extremity. The dilated tubes were usually thin and attenuated, of a white colour, and sometimes almost transparent. These dilated tubes, in many instances, ran parallel and close to each other, but in no instance were they found to communicate. Two or three isolated, calcareous, and cheesy nodules, the largest scarcely exceeding a hempseed in size, were found near the margin of the lower lobe, closely underlying the pleura. The parenchyma of the lung was generally soft and somewhat doughy; the free borders were emphysematous. Near the lower margin of the lung were several patches of firmer lung-tissue, which, on being divided, were found to contain dilated tubes; these tubes gaped on being cut across, and, in some instances, were plugged with inspissated mucus. They were much thickened by peri-bronchial overgrowth, which did not end abruptly, but radiated off into the sur-

rounding parenchyma. It was evident that these portions of the lungs were consolidated by adventitious fibrous tissue. Some of the tubes in the upper lobe of this lung were also dilated, but to a much less extent than those in the lower lobe. In the base of the right lung there were some dilatations of the smaller bronchial tubes, but the disease was much less advanced in this lung than in the other, and the middle and upper lobes were free from dilatations, but emphysematous. The right side of the heart was slightly hypertrophied and considerably dilated.

The results of the post-mortem examination were thus entirely in accordance with the diagnosis, for we found ample evidence of the existence of bronchitis, bronchiectasis, and emphysema. Of these the bronchitis was, undoubtedly, the original disease, of which the bronchiectasis and emphysema were secondary consequences. Bronchiectasis is always, indeed, a secondary disease, and never occurs excepting as a sequel to some other pulmonary affection. In this case, as I have said, it was the consequence of the long-standing bronchitis; and the dilatations had, no doubt, been in an advanced state for a considerable period antecedent to the last illness. It may, indeed, be objected to this view that bronchitis is a very common disease, which runs its course in a very large proportion of cases without the supervention of bronchiectasis; whereas, this latter disease is so comparatively rare that the cases which have been under our observation in the wards during any single season may be readily counted on the fingers. It is, nevertheless, an unquestionable fact that bronchiectasis is an occasional consequence of long-continued bronchitis; and the case now under our consideration affords a very good illustration of that fact.

I apprehend that, in the first place, the bronchial inflammation impairs the nutrition of the smaller bronchial tubes, producing atrophy, and thereby diminishing the tone and

elasticity of their walls. Tubes thus weakened would become unable to resist the amount of distension which healthy tubes are able to bear. Hence any such derangement of the mechanism of respiration, as would bring an increased pressure of air to bear upon them, would lead to their dilatation, and to still greater tenuity of their walls. This had obviously been the case in our patient, for you will recollect that we found the walls of many of the smaller tubes so thin as to be almost transparent; and I have, in other cases, seen the attenuated walls of dilated tubes so transparent that the subjacent textures could be seen through them.

That no adequate cause of such derangement of the mechanism of respiration was found at the post-mortem examination does not invalidate this view, for the case was a very chronic one, and conditions adequate to produce the effect may have formerly existed and subsequently passed away. For instance, some impediment to the passage of air through the smaller tubes to the bronchioles and air-cells, without any corresponding diminution in the quantity of air inhaled during the act of inspiration, may have caused overdistension of these tubes, which, by reason of diminished tonicity, may have yielded to the internal pressure thus brought to bear upon their walls. Perhaps the mere lodgment of thick tenacious mucus in the distal extremities of the tubes may, as Laennec supposed, have been a sufficient obstacle to the onward current of air to have produced overdistension of the tubes on the hither side of the obstruction; and yet this secretion may eventually have disappeared. Violent and often repeated fits of coughing also would inevitably bring increased pressure to bear upon the walls of the tubes, especially if the access of the air to the air-cells were impeded, and would thus also tend to produce their dilatation. In this respect, you cannot fail to observe an analogy between the mechanism which produces bronchiectasis, and that which



causes pulmonary emphysema. Both are due to the effect of distending force upon tissues which have lost their elasticity.

That impaired tone of the walls of the bronchial tubes is, in many cases, an important factor in the causation of bronchiectasis, is further proved by the circumstance that this disease is chiefly apt to attack feeble and ill-nourished persons. It is much more frequent among the poorer than the wealthier classes of society, and is most commonly met with in persons of broken-down constitution, in the prematurely old, the intemperate, or the ill-fed. The man Joseph P., you will remember, looked many years older than his stated age, and, though we had no definite evidence of his having been intemperate, he was obviously in broken health, and, probably, like most persons of his class, a free liver.

The dilated tubes in this patient's case were mainly situated in the lower lobes of the lungs, and near their periphery, which is, in my experience, and I think also in that of most other observers, the more common seat of the disease; though Rokitansky, a very high authority in all questions of pathological fact, says that the upper lobes are the more frequent seat of bronchial dilatation. But although I have found the lower lobes the most usual, they are by no means the exclusive seat of dilated tubes. I had under my care, in Murray Ward, in the early part of the present year, a maid-servant, who, like the man Joseph P., was admitted almost in a dying condition, and sank very soon afterwards. In her case the bronchiectasis was situated chiefly in the upper lobes of the lung.

CASE 51.—The patient, Louisa C. by name, was a well-nourished and not unhealthy-looking young woman, aged twenty-five years. Her family history showed a tendency to lung disease, her father having died of phthisis, and her mother being subject to bronchitis. Fourteen years ago the patient herself had had an attack of pleurisy on the left side,

and she had for the last four or five years been very liable to cough, especially in foggy weather and in winter. A fortnight before admission, on February 26, 1876, she began to cough and to feel languid, but did not at first expectorate much. Two or three days before presenting herself at the hospital she began to spit blood, and observed that the expectoration had an unpleasant, nauseous taste; she also became very short of breath, was unable to lie down in bed, and sweated profusely.

On admission, her face was flushed and somewhat cyanosed; the extremities of the fingers were clubbed. Respirations, 40; inspiration short and gasping; expiration prolonged, loud, very harsh, and ending, when forcible, in sibilus. The *alæ nasi* were in movement during respiration, and there was orthopnoea. Pulse, 138; temperature, 102·0°. Tongue moist but much furred. Percussion resonance everywhere good. The left side of the chest expanded less fully than the right. Very harsh creaking rhonchus was heard in the left infra-clavicular region; and abundant, large, rather high-toned crepitation, tubular breathing, and bronchophony in the left mammary region. Abundant moist crepitation was heard in the posterior base of the left lung; smaller crepitation, with rhonchus and sibilus, in the lower lobe and over the front of the right lung. The breath-sounds were audible over the *præcordia*; the heart-sounds were normal. The sputum was copious, muco-purulent, and of a pinkish-brown colour from admixture with blood. Both the breath and the sputum had a highly offensive odour. Urine normal.

No important change occurred in the patient's condition. The temperature fell to 100·0° shortly after admission, but the pulse increased in frequency; the respiration varied in frequency from 40 to 50 in the minute; the blueness of countenance increased, and the patient died on March 2.

On opening the thorax after death, the lungs were found in a state of inspiratory expansion; both were firmly bound to the diaphragm by old fibrous adhesions; the left lung was also firmly attached to the wall of the chest. The trachea and bronchi were filled with a reddish-brown fluid, of a penetrating gangrenous odour. The bronchi in each lung were laid open in every direction, from the main bronchus towards the periphery. On the right side the mucous membrane of the larger tubes presented a granular appearance; it was of a bright red colour, and was covered by a thick layer of soft, opaque, highly offensive secretion; no abrasion or ulceration could be discovered. As the tubes were traced onwards, they were seen to become more or less dilated, and to have their muscular coat notably hypertrophied. The dilatations were both cylindrical and saccular, and they increased both in number and size as the peripheral parts of the lung were reached; the terminal bronchioles equalling, and in many instances exceeding, in diameter, the larger tubules from which they sprang. Many of these were choked by semi-caseous, inspissated secretion. The dilatations were most obvious in the upper lobe, where but little remained besides a collection of thickened tubes, separated from each other by layers of condensed fibrous-looking lung-tissue. The lower lobe was œdematous, congested, and partially collapsed; the pleura covering it was rumpled, and its tissue broke down under slight pressure.

In following the bronchial tubes towards the apex of the left lung, several sudden saccular dilatations were seen, the surrounding lung-tissue being non-crepitant and rather firm. The mucous membrane was reddened, but the neighbouring lung-tissue was pale-coloured. No erosions nor ulcerations were found on the mucous surface. The dilated tubes were filled with the reddish-brown fetid secretion already described. At the apex, just below the greatly thickened

pleura, was a small cavity, lined with mucous membrane, continuous with that of the tube opening into it, which might easily have been taken for a phthisical cavity. In the same lung was another good example of uniform cavern-like dilatation; it measured one inch in circumference at its broadest part, half an inch at its proximal end, and five-eighths of an inch at its distal opening. The bronchiectasis was much more marked in this lobe than in the corresponding lobe of the right lung; the pulmonary tissue was tough, but generally crepitant. The anterior portion of both lungs was emphysematous.

The wall of the right ventricle of the heart was slightly hypertrophied, and the cavity dilated. The liver was large, fatty, and presented a nutmeg appearance. The spleen was a little large, and firm. The kidneys were also slightly tough; the capsule of the right one was rather adherent, and its surface a little uneven. The mucous membrane of the stomach was mammillated, and coated with thick, tenacious, glairy mucus.

In this, as in the former case, you will have observed that the bronchiectasis was secondary to bronchitis, which, in fact, I have found to be by far its most frequent antecedent; but the woman in this case presented none of the evidence of broken-down health so obvious in the man. On the contrary, she was well nourished, and, but for the distress of breathing incident to the recent attack of bronchitis, was a healthy-looking young woman. Although, therefore, some of the physical signs and constitutional symptoms might appear to indicate the existence of phthisis, the general aspect of the patient was altogether opposed to that view of the case. The high temperature indeed, and frequent pulse; the impaired expansion of the chest, and its unsymmetrical movement in respiration; the presence of high-toned, large crepitation in the upper lobe of the left lung, indicating the

presence of cavities, were all of them symptoms which might easily have led to the case being set down as one of phthisis; but I hesitated to accept this view, mainly on the ground of the absence of emaciation, or of alteration in the resonance on percussion over the site of the supposed cavities.

Evidence of the extremely chronic course of the disease was amply afforded both by the clinical history of the case and by the marked clubbing of the finger-ends, and it is at least very unusual for phthisis to run a very long chronic course, in young persons, unattended by emaciation. It is, perhaps, even more rare to find phthisis advanced to the stage of excavation without discovering at least some modification of the percussion resonance; whereas, as we have seen, no such modification of the normal resonance was present in this case. These facts, taken in conjunction with the fetid breath and expectoration, led me to suspect from the first that the case was one of dilated tubes rather than one of phthisis; though the rapid manner in which the patient sank left but slight opportunity for confirming my first impression by subsequent examination.

The difficulty attendant on the diagnosis of dilated tubes, when situated in the apex of a lung, from phthisis, was recognised by Louis, who relates an illustrative case in his classical work on phthisis. I quote the main facts of the case from Dr. Walshe's translation of Louis's work, published by the Sydenham Society. The patient, a labourer, fifty-nine years of age, who had been short-breathed from infancy, had not been free from pulmonary catarrh for the last ten years. The physical signs were—respiration almost perfectly tracheal; large-sized crepitant rhonchus under the right clavicle, and posteriorly, on the same side, in the corresponding region; marked resonance of the voice; imperfect pectoriloquy in the same places; chest sonorous all over the surface; pulse very slightly hurried. For the last six days of

life the sputum resembled a greenish *purée*. Death took place twenty days after the patient's admission into hospital, and, at the post-mortem examination, the lungs were found generally adherent to the costal pleura; 'a portion at the apex of the right lung, measuring two inches and four lines from above downwards, appeared to be transformed into a great number of cysts, varying in size between that of a pea and a large filbert. These seeming cysts, which were nothing more than dilated tubes, contained a mucous reddish liquid and a yellowish opaque matter varying in thickness; they were placed in contact with each other, formed of a membrane as thin as the mucous coat of the colon, somewhat red, very firm, and continuous with that of the bronchi, which were elsewhere perfectly healthy.' 'The same morbid condition existed in the apex of the left lung, but only implicated an inch and a half in width of the organ, and the dilatations of the bronchi were less marked. There were neither tubercles nor tubercular matter visible anywhere.'

Dr. Louis observes, with reference to this case, that he believed the patient to be affected with phthisis of very slow type, which had only given rise to very limited anatomical change. 'The perfect sonorousness of the chest under the clavicles made me,' he says, 'at first hesitate in my opinion; but auscultation denoting the existence of excavations there, I supposed them produced by the softening of tubercles—a notion apparently supported by the cough, the dyspnoea, the sputa, and, above all, by the locality in which the excavation existed. I was deceived, and I should probably err similarly again were a similar case to present itself to my observation.'

In Dr. Louis's case the sputa were opaque, greenish, and without yellowish striæ; and, so far as appears from the report, were not fetid. In my second case I attributed much diagnostic importance to the fetid gangrenous odour of the sputa, for though fetid sputum is observed in other

lung diseases, it is of rare occurrence, and its presence would in most cases lead me to suspect the existence of dilated bronchial tubes, unless pulmonary gangrene, or some other satisfactory explanation of its cause, should be apparent.

The bronchiectasis, in the case of our female patient, appears to have had a twofold origin. I apprehend that the bronchitis, from which she had suffered so repeatedly during several years, and the extensive and firm pleuritic adhesions, dating probably from childhood, were both concerned in producing it; the bronchitis by enfeebling the tone and diminishing the elasticity of the bronchial tubes; the pleuritic adhesions by preventing the free movement of the lungs in respiration, and more particularly of the left lung, which was the most firmly and extensively adherent, and in which, likewise, the dilatation of the tubes was the most extensive and the greatest. Such an impediment to the free movement of the lungs must necessarily diminish the force of the expiration in coughing, and increase the difficulty in expelling the mucus, especially from the smaller tubes. Hence its accumulation in these tubes would be likely to ensue, and, as we have seen, actually did take place; many of the tubes having been found choked up with tenacious semi-caseous mucus, which, from its state of inspissation, must have lain in them for some considerable time. This blocking up of the peripheral extremities of the tubes would undoubtedly cause the stream of air, during inspiration, to impinge with increased force upon the walls of the obstructed tubes, already diminished in tone and elasticity by the oft-recurring bronchitis, and these, being unable to resist the undue tension, would gradually yield and become dilated.

Both the patients whose cases have formed the basis of my remarks were almost moribund when they came under my care. Undoubtedly the bronchiectasis conduced to this result; but it could only have done so indirectly, for it must

in both cases have been of long standing, whereas the final illness was in each of the patients of comparatively short duration. The male patient, as you have heard, dated his fatal illness from only six weeks before his admission into the hospital, during the first four of which he continued his employment; and the illness of the female patient was of even shorter duration, for she had been attacked by one of her customary catarrhs only fourteen days before she sought admission into the wards.

Bronchiectasis, in fact, provided there be sufficient space of undamaged lung left to carry on the respiration, is for a long time compatible with comparative health. The young woman, whose last illness was the shorter of the two, was free from emaciation, and even had a healthy aspect. Nevertheless, the bronchiectasis, no doubt, conduced to the deaths of both these patients; and I apprehend that it did so because it had, in both cases, very gradually destroyed, for the purposes of respiration, a very considerable area of the lungs. In the man's case, the greater number of the smaller tubes in the lower lobe of the left lung were dilated, and, though to a less extent, a similar condition existed in the right lung also. In the woman's case, the loss of breathing capacity was chiefly situated in the upper lobes, which consisted of little more than collections of thickened tubes. In both cases the encroachment of the dilated tubes had destroyed, more or less completely, the surrounding vesicular lung-tissue, and rendered a considerable portion of the lung more or less incompetent for the performance of its proper physiological function.

But even this condition might have been borne longer with impunity, had it not been for the supervention of acute bronchitis; for the quantity of air required to be inhaled varies much in different circumstances. During repose the demand for air is much less than during exercise, and the



quantity required increases in proportion to the activity of the exercise. The lungs are therefore, probably, in health more capacious than the ordinary necessities of the system require; and, consequently, the destruction by disease of even a considerable portion of lung-tissue may be unattended with serious inconvenience, provided the remaining parts continue healthy, and there be no unwonted call upon their respiratory powers.

This especially holds good in the case of very chronic disease, during the slow progress of which the system becomes gradually habituated to the decreased capacity of the lungs. Such persons are short of breath on exertion, but they, perhaps unconsciously, accommodate their habits to their condition, and avoid such exertion as produces distress of breathing, and are thus comparatively comfortable at ordinary times. But, whenever any additional obstruction to the process of respiration supervenes upon their ordinary state, the distress and suffering become increased out of all proportion to the severity of the more recent ailment, and an attack which would be comparatively of little consequence in a healthy person may become very serious, or even fatal, in them. And this was precisely what occurred in the cases of both these patients. They were, indeed, subject to the oft-recurring catarrhs, to which patients suffering from bronchiectasis are always liable, but had been able to follow their ordinary employments until their last illness, and were so accustomed to their chronic ailments that they did not regard themselves as being seriously out of health. Nevertheless, when their already damaged lungs became the seats of extensive bronchitis, the additional decrease of breathing capacity thereby produced caused great distress, and so impeded the function of respiration that the blood was imperfectly aërated, and orthopnoea, cyanosis, and speedy death ensued.

## LECTURE X.

## BRONCHIECTASIS.

OCCASIONAL COMPLICATION WITH PHTHISIS—INDICATIONS FOR TREATMENT—MILIARY TUBERCLE SECONDARY TO CASEATION OF MUCUS IN BRONCHIAL TUBES—GANGRENE OF LUNG RESULTING FROM ULCERATION IN DILATED TUBES—IMMEDIATE CAUSES OF BRONCHIECTASIS; BRONCHITIS; PLEURISY; PNEUMONIA—MECHANISM: EXPANSIVE FORCE OF AIR ON WALLS OF BRONCHIAL TUBES; IMPAIRED ELASTICITY OR ATROPHY OF BRONCHIAL TUBES; CHANGED MOVEMENTS OF LUNGS IN RESPIRATION DUE TO CONSOLIDATION OR COLLAPSE; PLEURITIC ADHESIONS—BRONCHIECTASIS FROM EXTERNAL DILATING FORCE IN CONSOLIDATED LUNGS.

GENTLEMEN,—I invite your attention to-day to another case of bronchiectasis which has recently been in our wards. It differed from both those cases which formed the subject of my last lecture, inasmuch as it was much less severe than either of them, and the patient improved so much whilst under our care as to be discharged in a fair state of health.

CASE 52.—James D., aged nineteen years, and a labourer by occupation, was admitted into Founder Ward on January 12, 1876. He stated that he had suffered from small-pox when a youth, and also from measles, whooping-cough, and scarlet fever in boyhood; but had in other respects enjoyed good health until the previous autumn, when he had an attack of bronchitis, and was an inmate of this hospital, under the care of my colleague, Dr. Thompson, for several weeks. He was discharged well on December 18, but a fortnight afterwards was seized, whilst walking in the street, with such severe pain in the left side as compelled him to return home.

He sought aid here again on the following day, and continued to attend as an out-patient for some days, until, being unable, by reason of increasing illness, to walk to and from the hospital any longer, he was received into the wards. During the fortnight previous to his admission his expectoration had been occasionally streaked with blood, and he had, on one occasion, had a more definite attack of hæmoptysis.

On admission he was by no means an ill-nourished young man, and had not much dyspnœa. He still complained of pain in the left axillary region, and of cough, which occurred in paroxysms, and was attended by an abundant expectoration. Pulse, 108; temperature, 98·4°; respirations, 23. The resonance on percussion below the clavicles, and also in the supra-spinous fossæ, was slightly impaired, more especially on the right side. The breath-sounds were everywhere harsh, and the sound of expiration was very distinct. Loud creaking rhonchus was heard all over the front of the right, and sibilus over the front of the left, lung. The vocal resonance was bronchophonic below both clavicles, and also in the base of the right lung. Large crepitation was heard in the right mammary region, and in the posterior base of the right lung; smaller and less persistent crepitation in the base of the left lung. Pleuritic friction was detected in the left axillary region, corresponding with the situation of the severe pain which had ushered in the present illness. Heart-sounds normal. Urine normal. The expectoration was very abundant, and had a putrid, offensive smell; it consisted of a somewhat frothy, yellow-coloured, muco-purulent fluid, containing many nummular masses.

It is unnecessary for my present purpose to relate the minute variations in the patient's condition as detailed from day to day in the case-book. I therefore turn to the date of January 30, and find it recorded that the breathing was cavernous in the base of the right lung, and that broncho-

phony and large crepitation were still audible. Down to this time the pulse had ranged from 78 to 96, and the temperature, taken morning and evening, had usually been about  $98.4^{\circ}$ ; having only on one occasion reached  $99^{\circ}$ , whilst it had twice fallen as low as  $97.4^{\circ}$ . This, as you are well aware, is in accordance with the usual course of the temperature in chronic bronchitis; in which, when uncomplicated with acute disease or tuberculosis, the temperature is commonly rather below than above the normal standard.

On January 31, the patient complained of having slept badly, and of his cough having been very troublesome, and the expectoration unusually copious. He also said, for the first time, that he perceived a bad smell when he coughed, and that the sputum had a nauseous putrid taste. The pulse this day rose to 126, the respirations to 36, and the temperature to  $102.5^{\circ}$ .

This acute attack lasted three days, and then gradually subsided. On the evening of February 3, the temperature had fallen to  $98^{\circ}$ , and the pulse to 84. Next day the pulse came down to 72, and the temperature to  $97.2^{\circ}$ , and on auscultation, whilst the cavernous breathing and bronchophony were still distinct over the base of the right lung, no moist sounds were audible. No obvious external cause could be traced for this febrile attack, and I concluded at the time that the decomposing sputum, accumulated in the dilated tubes, had excited irritation in the adjoining alveolar tissue. The increased fetor and copiousness of the sputum coughed up during the attack, the disappearance of the abundant crepitation heard in the dilated tubes the day before the attack, together with the rapid subsidence of the febrile symptoms after the sputum was raised, are all points which, I think, afford strong corroborative support to this view of the case. From this time the patient improved rapidly, and was discharged on February 23.

During his stay in the hospital he never suffered from dyspnoea, was always able to lie down, and complained chiefly of cough; but, though free from dyspnoea, in the strict sense of the word, he was short of breath on exertion. The pulse varied somewhat from day to day, ranging from 78 to 90. The temperature never again exceeded  $98.4^{\circ}$ , and the respirations varied from 20 to 24. The character of the breath-sounds continued the same throughout: namely, harsh over the lungs generally, and tubular or cavernous in the posterior bases of the lungs and below the right mamma. Sometimes, when large crepitation was present, the cavernous breathing was less obvious. The amount of crepitation varied much from day to day, but upon the whole gradually decreased during the last three weeks that the patient was under observation. The sputum retained the same general characters, but latterly became less copious, much less offensive, and more tenacious.

The treatment was directed mainly to relieving the bronchitis, and improving the patient's general health. He was made to inhale, several times daily, the steam of boiling-water impregnated with oil of turpentine, and took a vegetable bitter, with 10 minims of diluted nitro-hydrochloric acid, three times in the day. At first, when his cough was still troublesome, especially at night, he took at bedtime a pill containing 5 grains of compound hemlock pill, and a  $\frac{1}{4}$  of a grain of hydrochlorate of morphia, and occasionally during the daytime a linctus containing syrup of squills, hydrocyanic acid, and a minute dose of morphia. He was in good condition and comparatively comfortable when he left the hospital.

When I say that this patient improved greatly under treatment, I do not mean to imply that the dilated bronchial tubes have resumed, or indeed ever can resume, their normal condition. The bronchitis, which is so commonly present in bronchiectasis, had subsided, and he left us quite able to

resume his work, and may, under favourable circumstances, live and continue his employment for many years; though he will unquestionably retain his malady, and will always be liable to suffer from recurrences of bronchitis. Each recurrence will tend to aggravate the bronchiectasis, until he may probably be cut off by a more than usually severe attack of catarrh; or else, towards middle life, the secondary consequences of respiratory obstruction may perhaps ensue, and lead to a fatal issue.

In my comments on the case of Joseph P., I remarked upon the similarity of the physical signs of bronchiectasis and those of phthisis, and the difficulty that this sometimes causes in forming an accurate diagnosis. This difficulty is, of course, much enhanced when, as sometimes happens, bronchiectasis is complicated with phthisis: a complication which existed in a patient recently discharged from under my care in Founder Ward. The case, I may observe, was not one of phthisis in which bronchiectasis had occurred as a complication, but was substantially one of bronchiectasis, the phthisis being inconsiderable in extent and perfectly quiescent.

CASE 53.—Joseph S., a married man, aged thirty-five years, a brewer's labourer by occupation, was admitted on May 2, 1876. Although employed in a brewery he had always been a temperate man, and had latterly altogether abstained from drinking. His family history was most satisfactory, his parents and six brothers and sisters being all alive and in good health. Until seven years ago his own health had also been uninterruptedly good. He had then had an attack of pneumonia on the left side, since which time he had suffered more or less from cough, which was always aggravated in winter. Three winters ago he spat up considerable quantities of blood for the space of three weeks. Since last Christmas his cough had been more troublesome

than before, and he had expectorated very copiously. The paroxysms of cough often ended with vomiting, more especially in the early morning on first awaking from sleep. He suffered much from cold feet and occasional chilliness, and perspired freely at night. He had lost much flesh, his weight being now, he stated, less by two stone than it had previously been.

On admission, notwithstanding his alleged loss of weight, he appeared but little emaciated. His pulse was 78; temperature, 98.6°. The breathing was almost entirely abdominal, there being scarcely any expansion and but little elevation of the chest-walls, even during full inspiration; this deficiency of thoracic movement was seen, on forcible breathing, to be most apparent on the left side. The resonance on percussion was generally fair over the whole of the chest both before and behind, though perhaps the note was a little less clear below the right clavicle. On auscultation, loud snoring rhonchus was heard generally over the front and upper part of the back of both lungs. The breath-sounds were everywhere harsh, and the expiration prolonged and very audible. Rather large crepitation, tubular breathing, and bronchophony were heard below the left clavicle, extending downwards as low as the third rib; below the right clavicle, a few scanty crackles and bronchophony were audible. In the posterior base of the left lung there were cavernous respiration, gurgling, and very pronounced bronchophony; the heart-sounds were normal.

The expectoration was very abundant, amounting to from twelve to eighteen ounces daily; it consisted of sulphur-coloured, flocculent masses, floating in an opaque yellow fluid, and contained much black pigment. On microscopical examination of the sputum, numerous large granular cells, and on rare occasions a bit of elastic lung-tissue, were seen. Whilst in the hospital the patient continued free from fever. The pulse ranged from 72 to 96; and the temperature, taken

carefully twice a day, never exceeded  $98.6^{\circ}$ . The cough was troublesome and paroxysmal, and was worst on first awaking in the morning, when it oftentimes ended in vomiting. The expectoration scarcely varied at all in character.

On May 30, the physical signs were:—Large gurgling and bronchophony in the posterior base of the left lung; blowing respiration, large crepitation and bronchophony in the left mammary region. Immediately below the right clavicle the breathing was tubular; a few faint clicks were elicited by forcible breathing, and both the vocal resonance and vibration were exaggerated. The sputum continued copious, and of the character already described.

I now ordered 20 minims of tincture of larch, with  $\frac{1}{2}$  a drachm each of mucilage of acacia and syrup of tolu, 5 minims of ipecacuanha wine, and 10 drachms of water, to be taken three times a day; a pill, consisting of 5 grains of compound hemlock pill and a  $\frac{1}{4}$  of a grain of hydrochlorate of morphia, to be taken at bedtime every night, and the linctus of morphia, already described, from time to time during the day when the cough was troublesome.

June 22.—Pulse, 80; temperature,  $97.6^{\circ}$ ; resonance on percussion quite clear below the left clavicle, slightly impaired below the right. Abundant large crepitation was still heard in both the apex and base of the left lung. Below the right clavicle the breath-sounds continued harsh and tubular; crepitation was also audible with inspiration, creaking sounds with expiration, and the vocal vibration was much more marked than on the left side. The expectoration had greatly diminished in quantity, and now consisted of small greenish-coloured, tenacious masses, but the cough remained troublesome, especially in the morning, when it still very frequently ended in sickness.

On June 29, the patient, finding himself much better, was discharged at his own request, and went into the



country. He presented himself at the hospital again for examination at the expiration of a month, much improved in aspect and general health, but still suffering from cough. The resonance on percussion was still somewhat impaired below the right clavicle, quite clear below the left. There was still large crepitation in the apex, and gurgling in the posterior base of the left lung. Beneath the right clavicle scanty high-toned crackling was also heard on deep breathing. The patient has not since been heard of.

When this man came into the hospital, the history of hæmoptysis, emaciation, and night-sweats led me at first to look upon the case as one of phthisis. Very soon, however, the entire absence of fever, the presence of large crepitation and bronchophony in the left lung without any evidence of pulmonary consolidation; the paroxysmal character of the cough; the great relief, lasting for some hours, after copious expectoration; the general character of the sputum; and, above all, the aspect of the patient, led me to the conclusion that, even though there might be phthisical mischief in the apex of the right lung, the chief distress and more prominent symptoms were due to a different cause. I had, therefore, no difficulty in deciding that the cavities in the apex and base of the left lung were the result of dilated bronchial tubes situated as usual chiefly in the peripheral twigs of the bronchial tree. Here no doubt the bronchiectasis was secondary to the attack of pneumonia, from which the patient had suffered so many years previously, and to the constant bronchial irritation which had succeeded to it. We may suppose that the nutrition of the bronchial tubes had been impaired from that time, and that the strain brought to bear upon the weakened walls by frequent fits of coughing had gradually produced dilatation of the tubes.

But although I feel no hesitation in attributing the more prominent symptoms in this patient to bronchiectasis, I am

also of opinion that there is some amount of phthisical disease in the apex of the right lung, although in a quiescent condition. I am led to this conclusion exclusively by the physical signs, for nothing in the history of the case is decisive as to the presence of phthisis, not even the copious hæmoptysis that occurred three years before he came under my observation; for copious hæmoptysis is not of rare occurrence in bronchiectasis. Night-sweats, from which this patient also suffered, are, moreover, as we have seen in the cases upon which I have already commented, not unusual in this disease.

The impaired resonance on percussion below the right clavicle and in that situation only; the increased vocal resonance, exaggerated vocal vibration, and the faint crackling heard on auscultation in the apex of the right lung, were the physical signs which, taken collectively, demonstrated to me the presence of phthisical mischief in the apex of that lung. This was confirmed by the appearance, in the expectoration, of elastic lung-tissue, though in very small quantity.

I need scarcely remind you that, in using the word phthisis, I do not mean in this case to infer the presence of tubercular phthisis, as that term is now employed; on the contrary, I am of opinion that the consolidation in the upper part of the right lung, in this patient, was rather the consequence of some inflammatory exudation at a former period than of tubercular deposit, because during the whole period of his residence in the hospital the temperature never exceeded the normal standard; whereas, in tubercular phthisis, however limited its extent or dormant its condition, there rarely fails to be at least a slight rise of temperature in the evening. Moreover, if there had been tubercular disease in the lung, it could scarcely have failed to have made more rapid progress during the period intervening between Christmas, when the man became so decidedly worse, and the month of

May, when he sought admission into the hospital; I can, indeed, conceive nothing so likely to have excited tubercular lung disease into increased activity as the constant bronchial irritation from which the patient was suffering, and the depressed condition of health which it occasioned.

I must not turn from the consideration of this case without a few words of explanation respecting the treatment employed. When the patient was admitted there appeared to me to be two chief indications for treatment; namely, the alleviation of the pulmonary irritation, and the improvement of the general health and nutrition of the patient. With the view of meeting the first of these I prescribed the same pill of hemlock and morphia, and the same morphia linctus which I gave to the other patients, whose cases have been previously under consideration. This may, indeed, appear a very routine mode of prescribing, but the indications were very much alike in each of these cases, and the convenience of employing, as far as possible, identical formulæ, in hospital practice, is obvious.

In order to meet the second indication, I prescribed a bitter infusion, with 10 minims of diluted nitro-hydrochloric acid, to be taken three times a day; and at the expiration of a few days, 2 drachms of cod-liver oil to be taken twice a day. The patient certainly improved much under this treatment as regarded his general health, but the expectoration continuing very copious, I presently substituted tincture of larch for the bitter tonic, in the hope of diminishing the secretion from the bronchial mucous membrane. The result was most satisfactory, for the expectoration, which had not sensibly decreased under the former treatment, now fell in quantity from fourteen or fifteen ounces to less than two ounces in the day. It also became more homogeneous and less nummular, and consisted of a yellow-coloured mucopurulent fluid of little tenacity.

Fortunately for the patient, we had not the opportunity of verifying the correctness of my diagnosis, but I entertain no doubt that it was correct, and that he really was at the same time the subject both of dilated bronchial tubes and of dormant phthisis. Some months ago I had under my care a patient in whom we found this combination of morbid lesions at the post-mortem examination. The case is one of very considerable interest, and therefore I shall read you a brief abstract of it.

CASE 54.—Henry P., aged fifty-eight, by occupation a joiner, was admitted into Founder Ward on September 2, 1874. Having myself been absent during the earlier part of the patient's residence in the hospital, I quote the state on admission from the very careful record of the case taken by the resident physician's assistant, Dr. Finlay. The patient, a man of temperate habits, had enjoyed uninterrupted good health until, at the age of forty, he had an attack of measles. From this, however, he perfectly recovered, and again continued well, until about a year previous to his admission into the hospital, when, after getting wet, he had a severe attack of catarrh, which left a permanent cough. About four months later he observed that his expectoration had an offensive odour, which continued to the time of his admission; he had also much shortness of breath, and frequently orthopnoea at night, compelling him to rise from bed and walk about his room, and latterly swelling of the feet and legs as high as the knees. He also stated that he had night-sweats.

On admission, he was a spare but not ill-nourished man. Pulse, 90; temperature, 99.7°; respirations, 40; urine normal; tongue furred and fissured. Radial arteries atheromatous. Breath very offensive. Shoulders arched forwards; scapulæ flattened; finger-ends bulbous. Chest fairly resonant over the front; expansion fair; breath-sounds harsh; expi-

ration prolonged. Scanty crepitation in the second left intercostal space. In the right fourth intercostal space, near the sternum, the breathing was of whiffing character and tubular; the vocal vibration exaggerated and the voice-sounds bronchophonic; and, on auscultation, harsh creaking sounds were heard. Over the back of the chest the resonance on percussion was nowhere quite clear. It was absolutely dull over the lower two-thirds of the right side; the breathing was generally harsh and tubular, and accompanied by dry creaking and sibilus. No moist sounds were heard on the left side. Crepitation and bronchophony and much increased vocal vibration were found in the base of the right lung. The expectoration consisted of flocculent greenish-yellow masses, floating in a transparent liquid, and had a very offensive smell.

Whilst the patient remained under observation, the pulse ranged from 90 to 100; the temperature from  $98^{\circ}$  to  $100.3^{\circ}$ . It was often normal in the morning, but commonly rose towards evening. I need not trouble you with further details of the case. At first the patient in some respects improved, the cough became less troublesome, and the expectoration diminished in quantity, though it still preserved the same characters. Gurgling was always heard in the right mammary region, and at the point of the right scapula. Towards the end of September diarrhœa set in, and the patient died on October 8.

At the post-mortem examination, both lungs were found adherent to the chest-walls, the right one inseparably, the left one much less firmly attached. The right lung was contracted behind the long ends of the ribs, and was covered by a firm fibrous layer of glistening aspect and semi-cartilaginous consistence, measuring one inch in thickness on the posterior surface of the organ, and diminishing considerably towards the anterior border. Two-thirds of the posterior portion of

the lung were converted into a mass of semi-fibrous tissue, in which were numerous irregular cavities, which freely communicated with each other. The principal cavities were situated about midway between the apex and the base, and were underlying the greatly thickened pleura. The cavities were more or less sinuous: they contained for the most part caseous semi-purulent plugs, and were in direct communication with the bronchial tubes. In many instances a tube was observed to widen out considerably on its entrance into the cavity; in others it opened abruptly into it; but, in every instance, the lining membrane of these cavities presented the same characters as those of the bronchial tubes leading to them.

The lower lobe of the lung was much reduced in size, and was almost converted into a congeries of sinuous cavities full of caseous material, while the demarcation between the lobes was lost. The anterior portion of the lung was equally solid, but contained no cavities. There was much fibrous tissue here, and also numerous groups of semi-transparent miliary granulations, and other groups which had already become opaque and of a yellow colour. The lining membrane of the bronchial tubes was red, vascular, and inflamed, and they were full of muco-purulent secretion. The pulmonary pleura of the left lung was about three times the normal thickness over the lower lobe and great part of the upper lobe; it was also covered by a layer of false membrane, which could be detached with facility. Over the upper lobe, where the pleura was thinnest, it was studded with minute miliary granulations, which, in some places, coalesced, and formed a distinct layer. On section, the lung was more or less solid throughout; the solidification was in part due to the presence of tubercular granulations, partly grey, partly yellow-coloured, a few of which were isolated, but the majority were densely massed together, infiltrating the organ.

The surrounding parenchyma presented recent pneumonic changes, but no cavities existed in this lung.

It is difficult to believe that the morbid lesions found in this patient's right lung can have originated so recently as a year before his death. On the contrary, I infer that he had an attack of pleurisy on the right side whilst suffering from measles many years before ; that the thickening of the pleura and the firm adhesion of the lung to the ribs—so firm that they could only be separated by cutting—took place at that time ; and that the dense fibrous changes in the lung-tissue and dilatation of the bronchial tubes gradually ensued during the intervening period, up to the time of the definite exposure in which his last illness originated. The adhesion of the left lung to the ribs was, as we have seen, much less firm, and might well have taken place during the last months of life.

It is not at all uncommon for patients with serious and slowly progressive chronic disease in one lung to enjoy fair health for a considerable period of time, even for many years, until an accession of acute catarrh cuts them off, it may be almost suddenly, after a very brief illness. This is precisely what I believe to have happened in this man's case. Notwithstanding the diseased condition of his right lung, he was in fairly good health till he got wet. He then contracted bronchitis, and, the movements of the right lung being restrained by the firm adhesion of the organ to the chest-wall, the bronchial secretion could not be perfectly expelled by coughing ; it therefore lodged in the bronchial tubes, became inspissated, and some of it underwent caseation. It may be presumed that the miliary granulations found in the lungs, and the infiltrating deposit in the left lung, originated by infection from these cheesy deposits. The case was, therefore, finally, one of pulmonary tuberculosis, secondary to bronchiectasis and caseous deposits in the bronchial tubes.

The putrid smell of the patient's breath and sputum, so often present in bronchiectasis, sometimes leads to the suspicion of the existence of gangrene of the lungs, a suspicion generally soon negatived by the history of the case and its slower progress under observation, together with the absence of the extreme depression which almost invariably attends pulmonary gangrene. Now and then, however, true gangrene is produced by the irritating nature of the sputum lying in the dilated bronchial tubes. A patient in whom this actually occurred was under my care last winter in bed No. 14, Founder Ward.

CASE 55.—Robert P., forty-two years of age, and a shoemaker by occupation, was admitted on October 28, 1875. He was obviously a man of broken-down health, and acknowledged that he had been a hard drinker; but stated that, nevertheless, his health had been unimpaired until two days before his admission into the hospital, when he had caught cold, and had begun to feel soreness of the throat and difficulty of breathing; he also had a troublesome cough and copious expectoration. This statement, so far as regarded his previous state of health, was unquestionably incorrect; for we found, at the post-mortem examination, as you will presently learn, that he must, at some antecedent time, have suffered from pleurisy. Shortly after coming into the hospital he exhibited symptoms of delirium tremens, and afterwards became so ill that we were unable to obtain a more reliable account of his previous state of health.

On admission, his pulse was 100; temperature, 101·8°; respirations, 24 per minute. Breath very offensive; urine sp. gr. 1021, acid, not albuminous. The resonance, on percussion, was fairly normal over the front of the chest, but the right side expanded less fully than, and rather lagged behind, the left. Resonance on percussion was much impaired over the lower half of the right posterior side of the thorax.



Over the front of both lungs the breath-sounds were harsh and accompanied by creaking rhonchus; over the lower and posterior third of the right lung the breathing was tubular, and high-toned crepitation and well-marked bronchophony were heard; at one point, about two inches below the angle of the scapula, there was gurgling and pectoriloquy. The vocal vibration was also much increased over the base of the right lung. In the base of the left lung the breath-sounds were coarse and tubular, and the voice-sounds were bronchophonic, especially at a point near the vertebræ. Moist crepitation was heard in the base; rhonchus and sibilus were heard in the upper part of the same lung. The expectoration was very copious, exceeding a pint in the day, mucopurulent, of a greenish colour, slightly frothy, and very fetid. The patient himself complained much of the foul smell. The fetor increased so much during the last week of life that deodorants were required to be freely used in the vicinity of the patient's bed.

At the post-mortem examination, the right lung was found to be almost inseparably attached to the chest-wall, proving the former existence of pleurisy. The bronchial tubes in the bases of both lungs were found much dilated. Ulceration had taken place in several of the dilatations in the right lung, and the surrounding lung-tissue was softened and of a black colour, and had a gangrenous odour. Excepting in the immediate vicinity of these gangrenous patches, the lung-tissue in the lower lobe of the lung was consolidated, firm, and fibrous; and the same held good, though to a less extent, with respect to the lower lobe of the left lung.

Various explanations of the immediate cause of bronchiectasis have been suggested, but each of them, taken by itself, seems to me too exclusive. As you will have observed from the cases which I have related, dilatation of the bronchial tubes may arise as a consequence of several diseases of

the lungs, such as bronchitis, pleurisy, and pneumonia. Sometimes we meet with it associated with consolidation of the lungs, at other times when these organs are quite free from consolidation. It is therefore improbable that any single explanation can be applicable to every case. We may, nevertheless, assume with much confidence that in the greater proportion of cases, loss of tone and elasticity in the walls of the bronchial tubes, whereby their power of resisting internal pressure is impaired, constitutes the first step in the process. Atrophy of the bronchial walls also obviously exists in many cases, and is sometimes so considerable that the subjacent tissues can be seen through the attenuated walls of the bronchial tubes. In many other cases, indeed, the walls of the bronchial tubes are greatly thickened, but such thickening in a large proportion of these cases takes place, I believe, subsequently to the dilatation. The collection of decomposing secretion in the tubes, which never fails to accompany the disease, must tend to keep up bronchial irritation, and so conduce to the overgrowth of the connective tissue around the bronchi, by which their walls are thickened.

I regard the altered nutrition and decreased elasticity of the bronchial tubes as being the primary factor in the dilatation of the bronchial tubes, in the class of cases which we have been considering. But it is only one factor; another is needed, as well, and this I believe to be some derangement of the mechanism of respiration, sufficient to cause increased expansive pressure upon the weakened walls of the bronchial tubes. This derangement may be caused by any condition which obstructs the inflowing current of air on its passage through the degenerated tubes towards the bronchioles and air-cells; such as plugging of the tubes with inspissated secretion, or the supervention of catarrhal pneumonia or of collapse of lung. The sudden diminution of space, in such circumstances, for the reception of air in the remoter parts of

the lungs, without corresponding diminution of the amount of air admitted during inspiration, must obviously bring increased air-pressure to bear upon the walls of the bronchial tubes ; causing such over-distension that, if these have already lost their elasticity, they will gradually yield, and dilatation of the tubes will take place. Again, pleuritic adhesions, by impeding the normal movements of the lungs during respiration, must so derange the equilibrium of air-pressure upon the surface of the bronchial tubes as to bring undue force to bear upon the walls of certain parts of the bronchial tree. This force may be insufficient to produce dilatation of tubes which still preserve their normal elasticity, but may yet be quite sufficient to cause them to give way if they are already weakened by previous disease.

There still remains one form of bronchiectasis to which I must briefly advert. It is that which we meet with in cirrhotic lungs. This was, many years ago, described by Sir Dominic Corrigan, and you will find upon the table several specimens which illustrate it. I beg, more especially, to direct your attention to one in my hand, which was taken from the body of a stonemason who died under my care many years ago in Founder Ward. When the patient was admitted into the hospital we found very deficient resonance on percussion over the upper and anterior part of the chest, and also over the whole posterior portion. Indeed, the dulness was almost absolute over the left mammary region and the whole of the left back of the thorax. Auscultation revealed the presence of cavities in the left mammary and supra-spinous regions. Notwithstanding these evidences of serious disease the patient did not appear to consider himself as very ill ; he had the aspect rather of a person suffering from pulmonary obstruction than from phthisis, and might, apparently, have survived some time longer but for the occurrence successively of attacks of diarrhoea and of profuse hæmoptysis, under which

his strength soon gave way. At the post-mortem examination the left lung was found to be firmly adherent to the posterior wall of the thorax. The posterior part of the upper lobe of this lung was converted into an extremely hard, dense, solid tissue of gristly consistence, which presented on section a perfectly smooth surface. The bronchial tubes in this consolidated portion of the lung were much dilated, and were, doubtless, the seat of the large crepitation heard during life. An irregular cavity, about two inches in diameter, was also found in the lower lobe, and it was evident that the hæmorrhage had proceeded from this cavity.

In this and similar cases, the dilatation of the bronchial tubes, as was believed by Sir Dominic Corrigan, is certainly in a great measure caused by the shrinking of the consolidated lung-tissue surrounding the tubes, resulting from the contraction of the proliferated connective tissue. It differs, therefore, from the form of bronchiectasis to which our attention has been hitherto directed, in which internal pressure acting upon the walls of degenerated bronchial tubes constitutes the essential factor in producing the dilatation, in that the dilating force is situated mainly outside, and not within, the bronchial tubes. This force, as already said, arises from contraction of the lung-tissue around the tubes, aided, it may perhaps be, in some degree by the pressure of the air upon the walls of the tubes and the expansive action of the thorax during the act of inspiration. Sometimes we undoubtedly meet with cases in which the two forms of bronchiectasis are combined in the same patient. In the case of Robert P. (Case 55), which I recently related, the bronchiectasis was, perhaps, of this mixed kind, having probably been caused partly by internal pressure upon the walls of the bronchial tubes, partly by the expansion of the tubes caused by the contraction of the consolidated parenchyma surrounding them.

As regards the treatment of bronchiectasis as an independent disease, I have no special suggestions to make. The disease is always a secondary one, and its treatment resolves itself, therefore, into that of the primary disease, together with the employment of such palliatives as may be required for the alleviation of the most distressing symptoms. When the sputum is very offensive, inhalations of turpentine or of creosote are often useful in diminishing the fetid odour, which is sometimes very distressing to the patient as well as annoying to the attendants; and when the expectoration is very copious, balsamic remedies, such as ammoniacum, compound tincture of benzoin, or tincture of larch, are very frequently of great service in diminishing the amount.

## LECTURE XI.

## PULMONARY EMPHYSEMA.

RELATIONS OF EMPHYSEMA WITH BRONCHITIS—VARIOUS OPINIONS AS TO THE MECHANICAL CAUSE OF EMPHYSEMA—CONSTITUTIONAL CHARACTER OF EMPHYSEMA: DISEASE OFTEN HEREDITARY: OFTEN FOUND IN SEVERAL MEMBERS OF THE SAME FAMILY; OFTEN IN CONNECTION WITH GOUT OR RHEUMATIC FEVER—DEVELOPMENT OF EMPHYSEMA USUALLY PRECEDED BY LOSS OF TONE IN PULMONARY TISSUES—SENILE EMPHYSEMA; COMPENSATORY EMPHYSEMA; CONSTITUTIONAL OR SUBSTANTIVE EMPHYSEMA; BRONCHITIC EMPHYSEMA—DEVELOPMENT OF SUBSTANTIVE EMPHYSEMA WITHOUT COUGH: INVARIABLE SUPERVENTION OF BRONCHITIS—INTIMATE CONNECTION OF THE GOUTY DYSCRASIA WITH SUBSTANTIVE EMPHYSEMA—COMPLICATION OF BRONCHITIS WITH EMPHYSEMA CAUSING TRICUSPID REGURGITATION, ALBUMINURIA AND ANASARCA; SAFETY-VALVE FUNCTION OF TRICUSPID VALVE—SIMULTANEOUS DEVELOPMENT OF BRONCHITIS AND EMPHYSEMA—EFFECTS OF EMPHYSEMA ON THE MECHANISM OF RESPIRATION WHEN THE DIAPHRAGM IS NOT DEPRESSED.

GENTLEMEN,—You may remember that several of the patients to whose cases I referred in my lectures on Chronic and Gouty Bronchitis, were also the subjects of pulmonary emphysema, or dilatation of the vesicular portion of the lungs; a condition often found to exist in connection with chronic bronchitis, and to which it may stand in very various relations. It undoubtedly sometimes happens that emphysema precedes bronchitis, and has made considerable progress before the accession of the latter disease; but the presence of emphysema so strongly predisposes to the occurrence of bronchitis, that sooner or later the two diseases become associated. Again, frequently arising, as we shall see, from a common constitutional cause, they sometimes run on together without its being possible to show that either had preceded or caused the

other. Lastly, emphysema appears in other, and by no means rare cases, to be a direct result of bronchitis. A lecture on pulmonary emphysema is, therefore, an appropriate sequel to those I have given on bronchitis; and will, I hope, profitably engage your attention on the present occasion.

I have said that the pathological condition called pulmonary emphysema consists in a dilatation of the vesicular portion of the lungs; the dilated air-cells contain air, and hence emphysematous portions of lung are usually of more than normal size. If the emphysema is general or extensive, the whole volume of the lungs is increased; and, as this increase in size is due to enlarged capacity for holding air, and not to hypertrophy of the lung-tissue, it is obvious, that the amount of air contained within emphysematous lungs must be materially greater than in the normal condition. From these circumstances arise the physical signs of emphysema: namely, partial bulging, or, if the emphysema be extensive, more general enlargement of the thorax, with increased clearness of percussion resonance over the emphysematous portions of lung; imperfect expansion of the thorax from the inability of the over-distended lungs to receive the normal amount of air; and, laborious breathing with the active co-operation of the cervical and other complementary muscles of respiration.

If the emphysema is very partial, it is usually secondary, both in origin and importance, to some other pulmonary lesion: if, on the other hand, it is general or extensive, it is sometimes, I am convinced, the primary disease; and is always, at the least, a very important complication of other diseases, giving rise in the course of time to very obvious symptoms, and to very serious secondary consequences.

Much ingenuity has been expended upon attempts to explain the mechanical causes of pulmonary, or, as it is frequently termed, vesicular emphysema. The distending force which operates is universally recognised to be air: but very

different opinions have been entertained as to the process by which it operates; that is to say, whether it effects the distension during the act of inspiration or that of expiration. It has also been a subject of debate whether emphysema is produced in pulmonary tissue which was previously altogether healthy, or whether it be not usually preceded by some abnormal condition of the emphysematous portions of lungs. It may be well, before explaining my own views, that I should give you a brief summary of the principal opinions which have been enunciated on these points.

First, then, as to the mechanism of emphysema; namely, whether it be produced during the act of inspiration or that of expiration. Laennec, who first accurately described pulmonary emphysema, having observed that this disease supervened almost always upon severe dry catarrh, imagined that the explanation of its mechanism was to be found in the obstructed condition of the bronchial tubes, incident to that complaint. Believing the force of inspiration to be much greater than that of expiration, he supposed that the air, which during inspiration had been able to overcome the resistance opposed to its entrance by the tumid state of the bronchial membrane or the accumulation of pearly sputa in the tubes, was unable to pass the same obstacles during expiration. This air remained, consequently, imprisoned in the air-cells: distending them more and more as fresh supplies of air were introduced by succeeding inspirations; until, at length, the cell-walls yielded to the pressure and became permanently dilated.

Such was the earliest view of the mechanism of emphysema. But it has been conclusively objected to it by Louis, that whilst bronchial obstruction is usually greatest in the posterior and lower parts of the lungs, emphysema, on the contrary, attains its maximum in the anterior and upper parts.

Several more or less divergent theories have subsequently



been advanced to account for the production of emphysema during inspiration, the most complete of which has been proposed by Professor Gairdner, of Glasgow. After stating his belief that the act of expiration is mechanically incapable of producing distension of the lung, or any part of it, Dr. Gairdner expresses his opinion that emphysema is a complementary lesion, dependent upon the occlusion of some of the air vesicles, with consequent collapse and diminished bulk of the corresponding portions of lung. According to this view, the air entering the lung during inspiration, being unable to penetrate the occluded, enters the free portions of the lung with increased force, and causes over-distension and dilatation of the walls of the air-cells in the hitherto healthy part of the lung. Dr. Gairdner's theory is undoubtedly correct as regards a certain class of cases of partial and rapidly developed emphysema, following upon acute pulmonary disease, but it is not, in my opinion, applicable to chronic or to general emphysema.

The opposite theory of the mechanism of emphysema, which ascribes its production to the act of expiration, is of comparatively modern date. A certain degree of influence on the development of emphysema had, indeed, long been attributed to the act of coughing; but the first definite assertion that lungs become emphysematous, not during inspiration, but from the effects of expiratory pressure, seems to have been made by Mendelsohn, a German physician, in a work on the 'Mechanism of Respiration and Circulation.' In support of his opinion, he adduced the circumstance that the uppermost parts of the lungs, which are confessedly the favourite seats of emphysema, are precisely those parts which are least distended during inspiration, and which can offer least resistance to the pressure of expiration.

By far the most able exponent of the expiratory theory, however, is Sir William Jenner, who joins issue with Dr.

Gairdner upon his assertion that the expiratory act is incapable of producing distension of any part of the lung, on account of the uniform pressure exerted, during expiration, by the external parietes of the thorax over the whole pulmonary surface. Sir William Jenner declares, on the contrary, his conviction that powerful expiration is by far the most common and efficient cause of vesicular emphysema; and shows in, I think, an unanswerable manner, the inequality of pressure, which must be exerted during violent expiration, upon different parts of the pulmonary surface, in consequence of certain parts of the thoracic walls being more yielding than others, and certain parts of the lungs being less firmly supported than others by neighbouring organs. He cites the undeniable fact that, whilst the powerful expiratory effort of coughing is tending to empty the lungs generally, the air is actually driven into the apices of the lungs with such force as to distend them to the utmost; and even, sometimes, to produce supra-clavicular bulging, which percussion proves to be pulmonary. And what is seen to be true of the apices of the lungs, Sir William Jenner adds, must be more or less true of all the comparatively unsupported parts which are not seen, such as the anterior margin, the margin of the base and others, which are all at the same time chosen seats of emphysema.

I entertain no doubt whatever, that, as regards the majority of cases, this theory of the mechanism of emphysema is correct, and that it is especially applicable to that large class of cases in which emphysema appears to be the direct result of bronchitis. I am, however, of opinion that emphysema may take place independently of the act of coughing, or of any violent expiratory efforts; and that, in certain constitutional conditions, the walls of the air-vesicles, being greatly deficient in tone and elasticity, gradually yield to the pressure brought to bear on them during the more or less forced respiration incidental to many ordinary occasions of

daily life. Indeed, I am satisfied that any theory of the origin of chronic and extensive emphysema, which would refer it exclusively, or mainly, to mere mechanical causes, is founded upon too narrow a view of the subject.

This brings me to the second, and, from my point of view, the more important question; namely, whether mechanical causes of distension usually produce emphysema in pulmonary tissue which was previously healthy, or whether its development be not usually preceded by some abnormal condition of the walls of the air-cells which become emphysematous.

This question applies chiefly to those cases in which the lungs become gradually and extensively emphysematous; for, as I stated in referring to Dr. Gairdner's theory, partial emphysema does occasionally take place in the healthy portions of otherwise diseased lungs. Laennec, as we have seen, appears to have regarded emphysema as the result of a mechanical process, taking place in those parts of lungs which had previously been the seats of extensive dry catarrh; but, nevertheless, his accurate clinical observation compelled him to recognise that, in certain cases, the dilatation of the cells appeared to be the primary affection, and the catarrh consecutive. Dr. Gairdner emphatically states as his opinion, that the source of emphysema is to be sought exclusively in a derangement of the mechanism of respiration, and not in any previously morbid condition of the affected part. On the other hand, Dr. Waters, the author of a valuable monograph 'On Emphysema of the Lungs,' entertains no doubt that the disease, in its severer forms, is of a constitutional nature; and that one of its most important features, and perhaps the primary step in it, is a malnutrition of the pulmonary tissue, causing its degeneration. My own opinion is even stronger on this point: for I regard degeneration of the tissue of the lungs as being undoubtedly, in at least the large majority of cases, the primary step towards the development of general emphysema.

Like many other constitutional diseases, pulmonary emphysema is frequently hereditary. Dr. Jackson, of Boston, U.S., long ago collected statistics which tended very strongly to prove the ordinarily hereditary character of this disease; and my own researches, made when in charge of out-patients, appear to me most strongly to support the same view. I may briefly state the result of these investigations: out of forty-two patients suffering from well-marked pulmonary emphysema, of whose cases I took notes during a period of two years, no less than twenty-three appeared to have had an hereditary tendency to the disease; in all of them, either a parent, or a brother or sister, and in a great number of them, several near relatives, had also suffered from emphysema. It is not uninteresting to add that, in a very considerable number of these patients, there was likewise a history of gout, either in themselves or in some near relative. As emphysema is undoubtedly very often a sequel of bronchitis, and bronchitis, as I have shown in a former lecture, frequently arises from a gouty constitution, it might perhaps be objected that the bronchitis, and not the emphysema, was the hereditary ailment in these cases. A conclusive answer to this objection would, however, be afforded by the circumstance that, in several of the cases, the bronchitis supervened under observation after the emphysema had been diagnosed.

Although many authorities have inferred the existence of some change in the pulmonary tissue, diminishing the tone and elasticity of the lungs, and thus predisposing them to the development of emphysema, very few suppositions have been hazarded as to the precise nature of that change.

Mr. Rainey, indeed, found in a case of emphysema extensive fatty degeneration of the walls of the air-vesicles; weakening, and in some cases wholly destroying, their texture: and this fatty change he, therefore, conceived to be the origin of pulmonary emphysema. Sir William Jenner, again, states

that the anatomical change in the lung which he has most frequently observed to result in the loss of its elasticity and contractility, is fibrous degeneration; the consequence of an exudation of lymph from capillaries, which have long been the seats of slight congestion, in persons of tolerably healthy constitution.

Dr. Waters, on the other hand, agrees neither with Mr. Rainey nor with Sir William Jenner. He states that, having carefully examined a large number of emphysematous lungs, he found, in the great majority of cases, no indication whatever of fatty matter; and he therefore cannot concur in the view of the dependence of emphysema upon fatty degeneration. Sir William Jenner's view he, as I think rightly, considers cannot apply to cases of primary emphysema, in which the degenerative process is the first step, and any congestion which may occur is only a secondary consequence; but what may be the exact nature of this degeneration, Dr. Waters adds, his own investigations do not enable him to state; neither is there any more definite light thrown upon it by the foreign (chiefly German) authorities, who hold the same views as Dr. Waters with regard to the constitutional origin of emphysema. It is, I think, extremely probable that the primary change in the walls of the air-cells, which renders them prone to undergo dilatation, may vary in different cases; but whatever the nature of the change it must impair their elasticity and nutrition.

Whatever views may be entertained respecting the exact pathological character of the changes that take place in the lung tissues in pulmonary emphysema, cases of this disease fall very naturally into several groups: there is, for instance, the emphysema of the aged, which is associated with senile atrophy of the lungs, in which these organs become shrunken rather than over-voluminous; again, there is that group of cases, to which Dr. Gairdner's explanation is applicable, in

which certain portions of a lung become emphysematous in consequence of the shrinking of other parts of the same lung. Considering the latter, or compensatory emphysema, as it may be called, as being usually of less consequence than the disease which has caused it; and, considering senile emphysema as being only one of the natural changes incidental to old age, I do not propose to occupy your attention with their further consideration.

There remain two well-marked groups of cases, namely, first that form in which constitutional, or as we may term it substantive, emphysema precedes, or, at least, runs on *pari passu* with bronchitis; and, secondly, that form in which bronchitis precedes and leads to the development of emphysema. In both these classes of cases the emphysema constitutes a very important, sometimes, indeed, the most important, part of the patient's ailment. It is to these two kinds of emphysema that I now propose to direct your attention.

Constitutional or substantive emphysema is usually slow of development; and, not unfrequently, so imperceptible in its advance that it is altogether overlooked until the accession of bronchitis, or of some other pulmonary complaint, forces it into notice. In such cases, the patient gradually passes from a condition of apparent health into a state of well-marked emphysema, without the pre-existence of any obvious pulmonary disease, or of any extraordinary mechanical cause, to account for its development. The dyspnoea attendant on emphysema creeps on by slow degrees, during months, or it may be years. At first, perhaps, it is only experienced in climbing a hill, or some similar unwonted exertion; and the patient becomes so inured to its presence that he accommodates his habits of life to its encroachments, and regards it as his normal condition, until its symptoms become suddenly aggravated by the accession of bronchitis.

I will now read you a case of substantive emphysema selected from out-patient practice.

CASE 56.—Arthur S., aged twenty-five years, by occupation a blacksmith, was admitted an out-patient under my care on June 14, 1868. Like many men of his craft, he was a free liver, and drank beer in large quantities, but without ever becoming intoxicated. Although a blacksmith, he had not been accustomed to heavy labour, his work having been always of the lighter description. His parents were both alive, as were also five brothers and sisters; but his mother had long suffered from chronic bronchitis and emphysema. About the previous Christmas he had begun to experience uneasiness, and a feeling of tightness and oppression in the thorax, with occasional pain in the mammary regions and below the shoulders; but unattended by either cough or expectoration. These symptoms continued to increase up to the time of his coming under my observation, when he was suffering also from occasional pain in the epigastrium, and from palpitation of the heart on making any exertion.

On exposing his chest, I found it prominent and rounded in front, flattened at the sides, and abnormally deep in its antero-posterior diameter. The sterno-cleido-mastoid muscles were large and prominent, and engaged even in ordinary respiration; and, on the patient being desired to take a deep breath, the scalene muscles likewise were brought into action, though in a less marked degree than in many of the cases to which I have from time to time directed your attention. The heart was seen beating in the epigastrium, and its impulse was also feebly felt below the seventh rib; but it could neither be seen nor felt in the normal situation. On percussion, the thorax was abnormally resonant from apex to base on both sides; even the normal dulness of the cardiac region being almost entirely masked by clear pulmonary resonance. The sound elicited by percussion over the back of the thorax

was also everywhere clear, though less strikingly so than in front; and there was no bulging of the posterior walls, but neither was there any depression. Viewed from behind, our patient had the appearance of a strong, well-made man; but, in front, there was manifest bulging of the thorax from below both clavicles to the base. The breath-sounds were feeble, but in no other respect abnormal. The heart-sounds were free from murmur; the pulse was 72, and somewhat feeble; the urine was normal. The man had the aspect of fair health, and his only subject of complaint was the constant uneasiness and sense of distension and oppression in the chest.

At the time of his coming under my care he had no cough, and stated that he had had none; but, a few weeks later, in consequence, as he supposed, of taking cold, he began to cough, and raised a scanty, frothy expectoration, which was occasionally streaked with florid blood.

This, I may tell you by the way, is not an uncommon incident in pulmonary emphysema. We rarely in this disease have hæmoptysis to any considerable amount, but in many, perhaps in most advanced cases, the sputum now and then presents streaks or specks of blood. Emphysema is usually a progressive disease; tending, moreover, to be aggravated by every cause of forcible pulmonary distension, such as coughing, or climbing, or lifting heavy weights. The distension of the air-vesicles is of course attended by stretching of the inter-cellular plexuses, so that the interspaces between the blood-vessels become larger and the vessels themselves become elongated; until, at length, some of them give way. This is particularly likely to happen in the paroxysmal fits of coughing common in emphysematous bronchitis; and hence it is, most frequently, during the intercurrent attacks of bronchitis to which emphysematous patients are liable, that the slight hæmoptysis which I have described is found to occur.



To return, however, to the case before us. Our patient, after five months' treatment, was discharged convalescent. The bronchitic symptoms had disappeared, and either the uneasy sensations for which he sought relief were mitigated, or he had become inured to them, as such patients usually do, more or less, in the course of time. Meanwhile the physical signs remained as before, neither increased nor decreased after the accession of the bronchitis. The thorax was still abnormally resonant, and the heart was still displaced downwards and inwards by the encroachment of the over-voluminous lungs.

Here then was a case of unequivocal pulmonary emphysema, which was neither preceded nor accompanied by any other pulmonary lesion which could be regarded as its cause. The attack of bronchitis, which occurred whilst the patient was under observation, supervened after the emphysema had been diagnosed; and the history of the case clearly points to the development of the emphysema, in a great degree, between Christmas and June; during which period the patient had, undoubtedly, been free from all other pulmonary disease. Moreover, if we may trust the patient's own report, he had never at any former time suffered from bronchitis; and we may at least be assured, from his inability to recollect it, that he had never suffered from any severe attack. I do not see how, looking at the history of the illness and the evidence of an hereditary tendency to the disease, we can avoid the conclusion that the primary cause of the emphysema is to be sought in some constitutional condition.

It is so important that you should be fully aware that emphysema, arising from a constitutional cause, may be developed to a considerable extent without the existence of bronchitis or of any other ailment, beyond gradually increasing dyspnoea and oppression at the chest, that I shall now proceed to read you the notes of another instructive case of the same kind.

CASE 57.—John H., aged forty-two, a stoutly-built man, of medium height and robust appearance, was admitted into Founder Ward, under my care, on September 19, 1865. He had served in the navy in early life, but had of late years been a messenger. He stated that his habits were strictly temperate, which I believe to have been true, and that his health had always been good. He had now, however, suffered for a considerable time from a sense of oppression at the chest and from shortness of breath, especially when making any exertion; and, on closer inquiry, I found that he had sometimes had colds with occasional slight cough. His family history showed a strong gouty tendency. His mother, indeed, was living and in good health, but his father had died, at the age of fifty-three, from chronic gout and its consequences; and of a brother and three sisters who besides himself had survived infancy, his brother and elder sister were both subject to attacks of regular gout. Having previously had no complaint except the dyspnœa, he had been seized, ten days before his admission into the hospital, with rigors, vertigo, and vomiting, followed by sweating and cough. Three days later, pain had come on in the right hip, knee, and ankle, and subsequently in both feet.

On admission there was redness and œdema of both ankles and of the right hand, and general tenderness of the muscles of the right calf and thigh. The skin was hot; the tongue coated with a creamy fur; the pulse 90, of good volume and strength. The urine was amber-coloured, acid, had a specific gravity of 1026, and was non-albuminous. The chest was broad and large, prominent in front and deep at the sides. It was very resonant on percussion over the whole front; over the back of the thorax the resonance was also clear. On auscultation, rhonchus and sibilus were heard over the upper parts of the thorax, and there was moist mucous crepitation in the lower and posterior parts of both lungs. The heart-

sounds were free from murmur, but the apex was somewhat depressed, and the over-lapping lungs encroached on the cardiac region so as to diminish the area of cardiac dulness.

The physical signs in this case clearly explained the cause of the dyspnoea and feeling of oppression at the chest, which had gradually come on whilst the man still regarded himself as quite well. The deep and prominent chest, the depression of the heart, and the diminished area of cardiac dulness, all pointed to an abnormal enlargement of the lungs; whilst the marked clearness of the percussion-note showed that this enlargement was due to an excess of air dilating the air-vesicles; in fact, to pulmonary emphysema. Had the increased size of the thorax arisen either from effusion of fluid, or from the escape of air, into the pleural cavity, the bulging would have been restricted to one side of the chest, the movements of which would have been unsymmetrical with those of the other side; whereas, in this case, although the expansion of the thorax was imperfect, its movements on the two sides were perfectly symmetrical. Moreover, on the first supposition, percussion would have yielded a perfectly dull note; whilst on the second, the resonance would have been tympanitic rather than, as it was, a mere exaggeration of the normal resonance: and in neither of the supposed cases would the bronchitic sounds have existed on the affected side.

The exact nature of the arthritic affection in this patient was at first difficult to determine. The pains had not commenced in any of the small joints, nor in the great toe, as is most common in gout; and they were attended by more sweating than is usual in that disease. On the other hand, the sweating was less profuse than it usually is in rheumatic fever; and the man had passed the period of life during which that disease is most apt to occur for the first time, and had attained the age about which gout very commonly begins, in persons who have an hereditary right to it. Being thus a little

uncertain as to the precise character of the ailment, I, in the first place, prescribed a draught containing 2 drachms of solution of acetate of ammonia, 1 scruple of acetate of potash, 15 minims of tincture of squill, 20 minims of tincture of henbane, and 10 drachms of camphor water; to be taken every six hours. I also gave him 2 grains of blue pill and 3 of compound rhubarb pill at bedtime, and the ordinary senna draught on the following morning.

On September 22, all doubt as to the nature of the case was set at rest by the characteristic appearance of gout in the left great toe, which was swollen and red, and so painful that the patient shrank from any approach to it. He was still perspiring, but the perspiration had not the strong sour smell belonging to rheumatic fever, and the skin was only moderately warm. The pains in the ankle and right hand, and the bronchitic symptoms, continued troublesome. I now ordered a night-pill containing 2 grains of the acetic extract of colchicum and 3 grains of compound powder of ipecacuanha, continuing the draught as before in the daytime.

On the 26th he was still suffering severely from pain in the great toe, foot, and knee; his tongue was coated with yellow fur; bowels free; urine clear, but high-coloured and acid. The pulse had fallen to 76, and the sweating had entirely ceased; but the bronchial irritation continued, and the patient expectorated with difficulty a scanty frothy sputum. The heart-sounds were normal; there was mucous crepitation in the posterior bases of both lungs, and sibilus and rhonchus were heard over the front and upper back of the thorax.

I now put my patient upon a plan of treatment which you have often seen me adopt with great advantage in cases of gouty bronchitis; that is to say, I prescribed for him a draught consisting of 5 grains each of iodide of potassium and carbonate of ammonia, 15 minims each of tincture of squill and wine of colchicum, and 20 minims of tincture of

henbane in  $1\frac{1}{2}$  ounce of camphor water; to be taken three times a day.

From this time very marked and rapid improvement took place. The gouty pains entirely disappeared, leaving, however, a notable amount of œdema of the left great toe, with itching and desquamation of the cuticle. The cough and other bronchitic symptoms abated, and the patient was almost convalescent in the first week of October. He then, however, began to be troubled with psoriasis of the arms, which lasted for some weeks, for which I gave him full doses of nitrohydrochloric acid. He was discharged on October 24, but continued to attend as an out-patient until he was cured of the psoriasis, and considered himself well. The physical signs of pulmonary emphysema of course remained, although not, so far as I could ascertain, aggravated by his recent illness; and the patient still had a certain amount of dyspnoea on exertion, which will, in all probability, increase with the advance of age.

The points in this case, to which I wish more particularly to draw your attention, are those bearing upon the diathesis, the existence of which was demonstrated by the symptoms and family history; and which I regard as having caused the primary change in the pulmonary tissue, leading to the development of emphysema.

You are already well acquainted with the relations subsisting between the gouty constitution and chronic bronchitis; and you will recollect many cases, to which I have from time to time directed your attention, in which gout, bronchitis, and psoriasis have alternated or coexisted. In several of the cases upon which I founded my lectures on gouty bronchitis, emphysema was also present; but, the bronchitis having been of comparatively long standing, there was no means of ascertaining which of the two diseases had preceded the other. In the history of the case just quoted,

however, there is nothing to countenance the supposition that the emphysema had been produced by the exertion of any undue or violent force upon the inner walls of the air-vesicles; during either the act of inspiration, or that of expiration. All the evidence, on the contrary, tends to show that some change had taken place in the pulmonary tissue itself, lessening its power of resistance to such an extent, that the walls of the air-vesicles became unable to resist the moderate augmentations of pressure, to which they were exposed in the ordinary contingencies of life.

Even if we consider that the slight catarrhal attacks, which the man had occasionally experienced, had had some influence in developing the emphysema, we can only regard them as having been able to produce such an effect, on the supposition that the lungs had previously lost their natural tone and elasticity. Upon any other supposition it would seem that, amongst persons exposed to the accidents of work and weather, the occurrence of pulmonary emphysema must be, not the exception, but the rule.

I am myself strongly of opinion that, in this case, the loss of tone and elasticity of the walls of the air-vesicles, which had caused them to yield to slight distending forces, was due to altered nutrition, the result of the gouty diathesis. It is well known that slow degeneration of the heart is common in persons of gouty constitution, more particularly where the attacks of regular gout are either pretermitted or imperfectly developed; and the comparative frequency with which emphysema, also, occurs in persons of gouty diathesis, has long since convinced me of the existence of a similar relation between it and some form of degeneration of the tissue of the lungs.

As I consider this view of the frequently constitutional origin of emphysema a subject of great practical importance, I shall make no apology for reading you a third case, in

which it appears to me beyond question that such degeneration of the pulmonary tissue had taken place, and had occasioned the spontaneous development of emphysema.

CASE 58.—Walter J., aged forty-five, a carver and gilder, became an out-patient at the Middlesex Hospital, under my care, on February 23, 1866. He had suffered annually from gout during seventeen or eighteen years, and had long found himself somewhat short of breath upon exertion, but stated positively that he had never had cough until a fortnight before I saw him, when he had taken cold from getting wet-shod.

On admission, he was manifestly suffering from recent catarrh, affecting the bronchial mucous membrane. He had much cough, attended by a thin, frothy, transparent expectoration, and a moderate degree of dyspnoea. His skin was warm; pulse, 72; tongue coated with a creamy fur; urine non-albuminous, sp. gr. 1018. The respiration was somewhat laboured; the muscles in front of the neck being in action, even during ordinary inspiration. The chest was deep in its antero-posterior diameter, broad and well-rounded in front. Percussion elicited an abnormally clear note over the whole front of the thorax, but more particularly in the mammary regions. The percussion resonance was also clear over the back. The heart was somewhat depressed, and its normal area of dulness diminished. The liver was likewise depressed; its margin being distinctly felt below the ribs. The breath-sounds were sibilant, and expiration was audible and prolonged over both lungs. Mucous crepitation was heard in the posterior base of the left lung. The heart-sounds were normal in character, but the impulse could neither be seen nor felt in the usual situation.

I need not, for my present purpose, detail the progress of the case under treatment. On May 15 the patient was discharged convalescent. His respiration was perfectly easy,

and he was all but free from cough, excepting in the morning, when he raised a scanty, thick, starch-like mucus, resembling the pearly sputum described by Laennec as attendant on dry catarrh.

This case was evidently one of general emphysema, for no other supposition could explain the displacement of the heart and liver, and the abnormal clearness of the resonance on percussion over the whole chest. It was, at the same time, a case of emphysema so gradually developed that it had caused the patient no inconvenience, beyond slight shortness of breath, until exposure to wet had brought on an attack of bronchitis. After one such occurrence, however, the bronchial membrane remained delicate, and a slight cause sufficed to bring on a second attack, for which the patient was readmitted, under my care, about two months later. The bronchitis, on this occasion, was complicated with anasarca and albuminuria. There was also a faint systolic murmur over the lower third of the sternum. The emphysema, which had caused so little distress while subsisting by itself, had now, when complicated with the bronchitis, so impeded the current of blood through the right side of the heart and throughout the venous system generally, as to induce venous congestion, and thus to cause both the albuminuria and the anasarca.

It might indeed be supposed probable that, as the man had so often and during so long a period suffered from gout, the kidneys had become the seats of gouty deposit, a condition which would have largely contributed to produce the albuminuria. But the comparatively normal character and specific gravity of the urine, and its uniform freedom from albumen during the patient's first attendance at the hospital, would appear to disprove the existence of any serious change of structure in the kidneys at that time. Moreover, as the bronchitis subsided, so likewise did the albuminuria and



anasarca, and the patient was finally discharged free from all these ailments. I believe, therefore, that both the albuminuria and anasarca were mainly, if not altogether, due to the effects produced upon the circulatory system by the bronchitis in conjunction with the emphysema.

Whenever emphysema is extensive, the obliteration of many of the capillary vessels, which causes the remarkably dry and anæmic appearance presented by emphysematous lungs, must necessarily impede the flow of blood through the pulmonary artery. This impediment excites the heart to increased efforts, and by degrees produces hypertrophy of the right ventricle, which may thus acquire just sufficient increase of power to enable it, in ordinary circumstances, to overcome the obstruction and maintain the balance of the circulation. But this compensation becomes insufficient when the obstruction due to bronchitis is suddenly added to that consequent upon the emphysema. As all obstacles to the circulation produce a backward pressure of the blood, this obstruction to the flow of blood through the pulmonary artery tends to prevent the emptying of the right ventricle during its contraction, and throws an unwonted strain upon the tricuspid valve, which may even yield to the pressure, and admit of the regurgitation of blood into the auricle; thus retarding the return of blood from the venous system to the heart. The obstruction to the venous circulation, again, causes congestive hyperæmia, more particularly of the abdominal organs; and hence may arise albuminuria from congestion of the kidneys, and anasarca from general venous congestion.

This, in fact, I believe to be the true explanation of the occurrence of the albuminuria and anasarca in the case before us, even though some slight previous disease of the kidneys should have predisposed them to suffer from the unaccustomed impediment to the circulation; and I regard,

as strongly confirmatory of my view in this matter, the patient's very rapid improvement under the use of remedies which relieved the bronchitis and venous congestion, and the entire disappearance of both the albuminuria and anasarca, before he discontinued his attendance at the hospital.

The systolic murmur, which I have mentioned as being audible at the time of the patient's readmission, and which also disappeared previous to his discharge, was probably due to the regurgitation of blood through the right auriculo-ventricular orifice. It is indeed true that in many cases of tricuspid regurgitation no murmur is audible, but in such cases the right ventricle and auricle are usually dilated, and the orifice itself being enlarged likewise, the blood passes freely backwards into the auricle without producing any sound. Whether the regurgitation ceased altogether, in this case, when the murmur disappeared, must remain a subject of doubt; for the cessation of the murmur, as I have just explained, by no means necessarily implies the absence of all reflux of blood through the auriculo-ventricular orifice: but it is quite conceivable that the regurgitation was only a temporary condition, due to the yielding of the valve to the unusual pressure caused by the distended state of the right ventricle.

The tricuspid valve is considered by some eminent authorities to be normally so constructed as to yield to the pressure caused by any temporary impediment to the flow of blood through the arterial orifice. John Hunter long ago remarked that the valves of the right side of the heart did not close so completely as those on the left side; but this safety-valve function of the tricuspid valve was first distinctly enunciated by Dr. Adams, of Dublin, and was very ably explained by the late Mr. T. W. King, in the second and sixth volumes of the first series of Guy's Hospital Reports. Dr. Adams looks 'upon this difference in the valves of the right and left sides of the heart as being a natural provision

to allow of a partial reflux into the right auricle on those occasions when, from any cause, the passage of the blood through the arterial opening is retarded.' Such a cause existed, as I have already explained, in the case under consideration; and I have no doubt that this was precisely the condition which gave rise to the systolic murmur, the duration of which corresponded closely with the duration of the bronchitic obstruction.

In conclusion, I must briefly recapitulate those features of the case which furnish, as I conceive, very strong evidence in favour of the opinions I have expressed in this lecture. The very recent accession of the first attack of bronchitis; the certainly much older date of the emphysema, judged from the shape of the chest and from the permanent displacement of the heart and liver; and lastly, the absence of any history of excessive mechanical force exerted on the walls of the air-vesicles in the course of the patient's occupation or otherwise; all point out this case as a genuine instance of constitutional or substantive emphysema, arising from his gouty constitution.

I would, however, by no means be understood to imply that the gouty constitution is the only one which may cause such loss of tone and elasticity in the lungs, as tends to the spontaneous development of emphysema; for, on the contrary, I have met with cases of obviously constitutional and hereditary emphysema, in which I have been unable to discover any history of gout either in the patient or his family. The main point which I desire to impress upon you is that, in my opinion, in a large majority of cases, mechanical or other determining causes produce emphysema only in lungs, the tissues of which are already predisposed to yield to their action by some form of degeneration.

In the cases which I have read to you to-day, the emphysema commenced before the bronchitis, which eventually

became associated with it. As, however, both chronic bronchitis and pulmonary emphysema frequently arise from constitutional causes, and indeed often from the same cause, it is quite intelligible that they should sometimes commence together, or that the coughing incident to bronchitis should very rapidly induce the development of emphysema in lungs constitutionally predisposed to it. The case of a person who was under my observation, as an out-patient, for several years, affords an excellent illustration of this class of cases.

CASE 59.—William E., aged thirty-seven, a rather short, square-built man, by occupation a coachman, accustomed to drink beer freely, was admitted an out-patient, under my care, on November 24, 1864. He had been first under my care, in the year 1862, for gout, of which he had had another attack in 1863, followed by bronchitis. To each of these diseases he had an hereditary right, his father having been gouty, and both his parents, as well as one sister, having been subject to chronic cough. He had himself had slight cough in winter for several years, and had now again been suffering from it for a fortnight. The cough was attended by a copious, thick, transparent expectoration; which, he said, closely resembled starch in appearance.

On admission, his voice was hoarse, skin cool, pulse 72, and of good volume. The respirations were 22, and chiefly abdominal; the thorax expanding comparatively little in ordinary respiration, whilst the abdominal movements were very marked. His breathing was not in general much distressed, but he suffered occasionally from severe attacks of dyspnoea. His chest was broad, prominent, and very resonant on percussion over the whole front, including the cardiac region. The apex-beat of the heart was not visible. The heart-sounds were feeble and distant, but free from murmur; normal in rhythm, and best heard on the left side of the epigastrium. The sounds of respiration were feeble;

but, with the exception of slight rhonchus in the base of the left lung, they were almost normal. I prescribed a draught, containing 20 minims each of compound tincture of gentian and tincture of henbane, with 10 minims each of diluted nitro-hydrochloric acid and ipecacuanha wine, in  $1\frac{1}{2}$  ounce of water, to be taken three times a day, and 5 grains of compound pill of hemlock to be taken every night at bedtime. I also directed him to discontinue drinking beer, which was likely to aggravate the bronchitis, and pretty sure to bring on a recurrence of gout.

Under this treatment my patient improved very much; and, although he continued to attend at the hospital, I may pass on to the notes of his case taken on January 26, 1865; on which day he complained of an accession of cough, attended by the same transparent, bluish expectoration which he had been raising when he came under treatment in the preceding November. He attributed, and no doubt very justly, the aggravation of his ailments to the fogs which had prevailed for some days; and he also stated that whenever he inhaled much dust, as he sometimes could not avoid doing, in the stable, he always suffered from a temporary exacerbation of his complaint. He continued under observation until the end of March, when he was discharged apparently well.

He spent the summer in the country, where he had two attacks of asthmatic dyspnoea. These came on at night, awaking him out of sleep about midnight, and the paroxysms recurred on each occasion for three or four successive nights. The difficulty of breathing was sufficient to cause orthopnoea, and the attacks were attended by cough and expectoration. He was readmitted, under my care, on September 21, 1865, having then been in London again for three weeks, and free from asthma until the night preceding his admission. This attack had manifestly been connected

with an accession of bronchial catarrh, for he was coughing much and raising a scanty frothy sputum. The skin was cool, but moist; the pulse, 72; the respirations, about 18. The front of the chest was, as before, very resonant on percussion, but the respiration was wheezy, the sound of expiration prolonged, and sibilus and rhonchus were audible over both lungs. Under treatment similar to that adopted the year before, the patient again improved, and was discharged, in the course of a few weeks, in comfortable health, and quite free from cough and expectoration. He continued well until the end of January 1866, when he had a fresh accession of catarrh, and again presented himself at the hospital, complaining of cough and dyspnoea in the morning, of wheezing at night, and of pain and soreness in the soles of his feet. The expectoration was transparent, thick, and rather scanty; the skin, moist; the pulse, 84. The respiration was somewhat laborious, and the heart's impulse was seen and felt only below the xiphoid cartilage. The percussion over the thorax was remarkably clear, more particularly over the fourth rib on either side, where also the vocal vibration was very feeble. The patient again recovered, and continued unusually well for some months, escaping altogether the asthmatic paroxysms from which he had suffered during the previous summer.

On September 8, 1866, however, he had a shivering, followed in the evening of the next day by a severe attack of dyspnoea, amounting to orthopnoea. The dyspnoea was more persistent than on former occasions, but he still became comparatively well by the middle of the day and able to do his work as usual. He had similar attacks every successive night until September 13, on which day I saw him. His pulse was quicker than in his former illnesses, being from 86 to 90, and he was expectorating with difficulty a scanty, white, frothy sputum. His breathing was more laborious than I had yet

seen it, the muscles in the front of the neck being now, as well as the abdominal muscles, in powerful action to assist the respiratory efforts. The sounds of respiration were somewhat harsh and dry, and expiration was prolonged.

In addition to treatment similar to that prescribed on former occasions, I now directed the patient to smoke a stramonium cigarette as soon as he felt the commencement of an asthmatic attack. He derived much relief from the stramonium, which never failed to shorten and mitigate the asthmatic paroxysms, and in a few days he was able to dispense with the cigarettes, and continued free from asthma until early in November. On the 3rd and 6th of that month he had attacks which were slighter than formerly, and did not disturb him at night, but came on when he first rose in the morning. On each occasion he smoked a cigarette, with, as he believed, very great advantage. He was desired to continue the use of the cigarettes when required, and to take a draught containing 3 grains of iodide of potassium, 5 grains of carbonate of ammonia, and 20 minims each of the tinctures of squill and henbane, in  $1\frac{1}{2}$  ounce of camphor water, three times a day.

My last note of this patient is dated January 29, 1867, when he reported himself as feeling greatly better than he had done for several years. He had had no attack of dyspnoea since November; his breathing was quite comfortable excepting on foggy mornings, when he suffered slightly from shortness of breath. The physical signs of emphysema, however, remained, as before; and although the patient was quite free from subjective respiratory distress, the sterno-cleido-mastoid and scalene muscles were somewhat hypertrophied; being engaged in ordinary respiration, though not in the laborious manner often seen in cases of extensive emphysema. The expansion of the chest was imperfect, but its movements were regular and symmetrical on the two sides. The abdominal

muscles were in unusual activity, and so much hypertrophied that the situation of the *linea alba* and *lineæ transversæ* were distinctly marked by furrows. There was slight regurgitation of blood into the veins of the neck, but no cardiac murmur. The heart's impulse was feeble, and the beat was faintly seen in the epigastrium.

There are many points of interest in the case I have just read, but, I wish, more especially, to direct your attention to those which relate to the emphysema and its effects upon the mechanism of respiration. I have already alluded to the very exceptional degree of comfort which this patient enjoyed, during the intervals between the bronchitic attacks, compared with most persons whom I have seen suffering from equally extensive emphysema. When last examined he declared that his breathing was quite easy, and that he was not in the least distressed at his work.

This immunity from the suffering usually incident to his condition, I attribute to a feature in his case which, in my experience, is of rare occurrence in chronic general emphysema, but which was mentioned thirty years ago by Dr. Stokes in his excellent work on Diseases of the Chest. Dr. Stokes there draws a distinction between those cases of emphysema, or, as he terms it, dilatation of the air-cells, in which the diaphragm is displaced downwards, and those in which it is not so displaced; and relates the case of a young man who exhibited all the characteristic signs of emphysema, together with great enlargement of the chest, but without any evidence of depression of the diaphragm. This young man did not suffer from difficulty of breathing in the intervals during which he was free from bronchitis, and was able to take very active exercise; having, only a short time before he entered the Meath Hospital, walked a distance of forty miles in the course of a single day. The chief inconvenience he experienced was the frequent occurrence of bronchitic attacks.



This was precisely the condition of my patient, whose case evidently belonged to the same class; for it was manifest, on inspection of his chest, that no material downward displacement of the diaphragm had been caused by the pressure of the enlarged lungs. The fulness of the epigastrium, which is observed when the heart, diaphragm, and liver are displaced downwards, did not exist; and the respiration was more abdominal than is consistent with any great interference with the position of the diaphragm. The heart, it is true, was displaced backwards and inwards, apparently by the overlapping of the enlarged lungs, and it could be seen and felt beating on the left side of the epigastrium, near the margin of the ribs. But the impulse was moderate and the pulse of good volume; showing an absence of that violent action of the heart, and also of that disproportion between the cardiac impulse and the radial pulse, which are frequently present in emphysema involving much downward displacement of the heart.

The explanation of this remarkable feature in our patient's case I believe to be, that the cartilages of the ribs, being still elastic, had allowed the parietes of the thorax to yield gradually, as the emphysema developed, to the increasing volume of the lungs; which had not, therefore, exercised upon the diaphragm more downward pressure than it was able to resist; and its normal function of enlarging the capacity of the thorax during inspiration was, in consequence, still duly performed. To these two circumstances, namely, the unimpaired elasticity of the walls of the chest and the ability of the diaphragm to do its proper work, it was, doubtless, due that our patient's inspiration had, at ordinary times, a much less spasmodic character than is usual in cases of general emphysema; the chest still expanding, though imperfectly, and the muscles of the neck being called into only moderate action as elevators of the thorax. Again, the position and action of

the diaphragm being little interfered with, the abdominal muscles could be called into unusual activity to assist the performance of expiration. This they did to the extent of rendering it a visibly active process, till they had at length become hypertrophied in the manner I have described; the situations of the *linea alba* and *lineæ transversæ* being marked by deep furrows.

In fact, I apprehend that the degree of accessory aid thus given to the act of expiration, nearly compensated at ordinary times for the loss of contractile power in the lungs; and, therefore, rendered unnecessary the painful inspiratory efforts usually made by emphysematous patients. Moreover, although the right side of the heart was hypertrophied, and perhaps dilated, in consequence of the impeded flow of blood through the lungs, here again the increased power seemed at ordinary times just to balance the impediment. It is too probable, indeed, that later in life, especially when the bony cage of the thorax eventually becomes rigid, the balance may be destroyed; for, as you are aware, the emphysematous lungs can never return to their normal condition. But, if the patient should continue careful in his habits, and can escape serious bronchitic attacks, the further progress of the disease may be retarded, and the balance which seems to be now established may be long maintained, and may enable him to live on in comfort for many years.

This case, I think, clearly belongs to that class of cases in which, although the bronchitis acts as the immediate exciting cause of the emphysema, there has been some previous loss of tone and elasticity in the walls of the air-vesicles, predisposing to its development. The advanced stage of the emphysema, at the time of my first examination, showed that either it must have commenced simultaneously with the bronchitis; or that, at least, the coughing incident to the latter must have induced the development of the emphysema

far more rapidly and generally than it usually does, in lungs not constitutionally predisposed to it.

I regard the case, in fact, as one in which the bronchitis and emphysema arose out of the same constitutional cause, and, I do not doubt, you will have already inferred my opinion, that the gouty constitution which was hereditary in the patient, and which had shown itself in regular attacks of gout previous to the accession of the bronchitis, was in his case the remote cause of the emphysema as well as of the bronchitis.

## LECTURE XII.

## PULMONARY EMPHYSEMA.

EMPHYSEMA RESULTING FROM BRONCHITIS—SUPERVENTION OF EMPHYSEMA UPON LONG-STANDING BRONCHITIS; PITUITOUS CATARRH; PAROXYSMS OF ASTHMA—PERVERSION OF THE MECHANISM OF RESPIRATION IN EMPHYSEMA WHEN THE DIAPHRAGM IS DEPRESSED—DEFORMITY OF THORAX CAUSED BY EMPHYSEMA—DYSPŒA OF EMPHYSEMA DUE TO DIMINISHED POWER OF EXPIRATION.

GENTLEMEN,—In a former lecture on pulmonary emphysema, I fully discussed the mode in which it is produced, the symptoms which characterise it, and the consequences to which it gives rise. Discarding from our present consideration the atrophic form of the disease met with in the aged, and the compensatory form which results from the dilatation of some portions of a lung to compensate for the shrinking or collapse of other portions of the same lung, I divided emphysema into two kinds; namely, first, that in which some constitutional disorder has impaired the nutrition and diminished the strength and elasticity of the alveolar walls, previous to the occurrence of any cause of forcible distension; and, even sometimes to such an extent that the moderate force brought to bear upon them in daily life, will cause them to yield without the intervention of any unusual strain; and, secondly, that in which the loss of tone and elasticity, that predisposes the alveolar walls to yield, is caused by repeated attacks of bronchitis. On that occasion, I directed your attention exclusively to the first of these forms of pulmonary

emphysema, that, namely, which I called constitutional or substantive emphysema.

To-day I shall ask your attention to the other form of the disease, in which bronchitis precedes and leads to the development of emphysema without the aid of any constitutional predisposition. This may happen in several ways. You may recollect that in my lectures on Capillary Bronchitis and Laennec's Dry Catarrh, I described a condition, sometimes called spurious, at others acute emphysema, in which the air-cells are over-distended with residual air, in consequence of impeded expiration, and symptoms resembling those of true pulmonary emphysema present themselves to our notice. In the cases I then described this condition entirely subsided, as it frequently does when its cause ceased; but, nevertheless, its frequent repetition must undoubtedly impair the elasticity of the alveolar walls, and at length cause true emphysema. Frequent and forcible distension of certain parts of the lungs, during paroxysms of violent coughing, or nutritive changes in the tissue of the lungs, consequent upon repeated attacks of bronchitis, may also impair the tone and elasticity of the alveolar walls and lead to the same result; or again, as is more probable, these several causes may be variously combined.

From whatever cause general emphysema may arise, its symptoms and consequences are of the same kind. Having entered very fully into this branch of the subject in my former lecture, I shall content myself to-day with relating several cases and drawing your attention to their more important features.

The first case, to which I beg your attention, is that of a man who is lying in Bed No. 16 Founder Ward.

CASE 60.—John C., a tailor by trade, aged thirty-one years, was admitted on September 17, 1877. He has been, I believe, of strictly temperate habits, and his family history is

free from either pulmonary or any other form of constitutional disease. The patient himself has been subject to bronchial attacks from childhood, and has long suffered from shortness of breath. He attributes these ailments to having been dipped into a well when a child only three years of age. About six weeks ago, he caught a severe cold by sleeping on the floor, and began, at once, to cough and expectorate. He also suffered from frequent vomiting. Continuing to become progressively worse he sought an admission into the hospital.

On admission, the pulse was 80; temperature, 99.6°. Urine, sp. gr. 1015, acid, not albuminous. The patient lay upon his back; the breathing was laboured, and accompanied by wheezing. The chest was rounded in front, deep in its antero-posterior diameter, and expanded very imperfectly during inspiration. On deep breathing the auxiliary muscles of respiration were brought into play. The chest was everywhere over-resonant on percussion, the ordinary area of præcordial dulness, even, being obscured by lung resonance. The heart-sounds were free from murmur but muffled. Expiration was greatly prolonged; loud sibilus and occasionally rhonchus were heard throughout both lungs, completely masking the normal breath-sounds. The cough occurred in frequent abortive paroxysms; and he raised a copious, watery, frothy mucus containing a small proportion of opaque sputum. The tongue was clean and the skin moist.

He was ordered 5 grains of carbonate of ammonia, 3 grains of iodide of potassium, 15 minims of spirit of chloroform, and 1 ounce of water, to be taken three times a day.

Two days later the iodide was discontinued and a draught containing tincture of squill and solution of acetate of ammonia substituted for it. The patient now rapidly improved, but sibilus was still audible over both lungs. The sputum continued copious, and consisted of ropy, transparent mucus, containing much black pigment and a few streaks of yellow-

coloured phlegm. He was discharged, at his own request, on October 6, and became an out-patient.

After leaving the hospital the patient resumed his work in a draughty tailor's shop, and his cough and other symptoms very soon became aggravated; he was therefore readmitted into the ward on October 23. He was much worse on this than the previous occasion; the temperature was  $102\cdot0^{\circ}$ ; pulse, 124; respirations, 40. The breathing was very laborious; the chest expanded very little, but was raised upwards in a jerky manner when the patient inspired. The whole front of the chest, including the præcordia, was over-resonant on percussion; the back of the thorax was also over-resonant, especially on the left side. The expiration was everywhere prolonged and accompanied with rhonchus; crepitation was audible in both supra-spinous fossæ; sibilus in the bases of the lungs. The cough was frequent, hard, and abortive. The sputum was less copious than before, frothy, and contained some opaque masses.

He was ordered 2 drachms of solution of acetate of ammonia, 5 minims of antimonial wine,  $\frac{1}{2}$  a drachm of syrup of poppy, and 10 drachms of camphor water, to be taken every four hours. In the evening of the same day his temperature was  $103\cdot6^{\circ}$ ; pulse, 112. His breathing was much distressed, and he was unable to lie down.

On October 24, the patient had suffered from constant orthopnœa during the night. The temperature was  $102\cdot0^{\circ}$ ; pulse, 112; respirations, 38; cough very troublesome. The expectoration was copious, and consisted of a clear frothy mucus. Urine normal, sp. gr. 1020. The liver was felt below the costal arch, and was tender on pressure. Crepitation was still audible in both supra-spinous fossæ; dry and moist sounds were heard over the front of the lungs; dry sounds only in the posterior bases. The first sound of the heart was long and rough, but there was no definite murmur. He was

ordered turpentine inhalations, and mustard and linseed poultices were applied over the back of the thorax. The draught with antimonial wine was continued.

October 25.—Temperature,  $101.7^{\circ}$ ; pulse, 112; respirations, 36. Cough and breathing troublesome; expectoration copious, watery, and frothy. To take a draught containing ether, aromatic spirit of ammonia, and syrup of tolu, occasionally, when the dyspnoea is urgent, and to continue the other treatment.

From this time he improved, though very slowly, and when discharged, at the end of November, the breath-sounds were not altogether free from wheezing, and there, of course, still remained all the physical signs of emphysema.

Observe, in reference to this case, that the expectoration was copious and watery; the patient raised from 18 to 24 ounces of frothy, liquid sputum, closely resembling white of egg and water, in the course of the day. In this respect the case resembled the pituitous catarrh of Laennec; but, as the patient improved, the sputum became less copious, and eventually, towards the end of his residence in the hospital, assumed the character of *sputum coctum*. Another point of much interest in the case was the co-existence of gastric with bronchial catarrh. Vomiting was a prominent symptom at the beginning of the illness and an occasional one throughout. Sometimes, no doubt, the sickness was the result of a coughing fit supervening soon after a meal, but the patient himself had observed that, even when not sick, he was apt to feel oppressed and to suffer more severely from dyspnoea after food than at other times. Moreover, on several occasions, not mentioned in the brief abstract of the case which I have read, when the symptoms appeared stationary, a dose of calomel at bedtime, followed the next morning by a saline aperient, afforded much relief, and the patient afterwards began, at once, to make more satisfactory progress.



I had under my care in Founder Ward, about a year ago, a case in which emphysema appears to have been developed as a result of repeated attacks of bronchitis, and in which, as in the last patient, there was no history of the existence either of gout or of any pulmonary disease in the patient's family.

CASE 61.—Walter R., aged forty-four years, a coachman by occupation, was admitted on October 18, 1876. The patient had resided for some years in Paris where he had suffered from some kind of fever six years before. Since that time he had been subject to winter cough but not to shortness of breath. He got wet through about seven weeks ago, and then began to suffer from tightness of the chest, cough, and shortness of breath, with orthopnoea at night.

On admission, the temperature was  $99.4^{\circ}$ ; the pulse, 96; respirations, 30. The tongue was coated with a thick creamy fur; the voice was hoarse; the breathing much embarrassed. The cough was frequent and abortive. The chest was deep in its antero-posterior diameter, and over-resonant on percussion both before and behind. The lung resonance entirely masked the præcordial dulness; the heart-sounds were muffled but otherwise normal. The expiration was everywhere audible over the lungs and prolonged; sibilus was audible over the whole of both lungs, and faint crepitation in the posterior base of the left lung. The urine was normal. The sputum consisted of a scanty, frothy fluid of a greenish colour.

It is not necessary to follow the daily details of the case; the patient remained in the hospital until the middle of January 1877, and was then discharged to go to Paris where he had friends. He was much better than on admission, but by no means well. During his stay in the ward, his state varied much from day to day, but his cough was always troublesome, and for the most part abortive, and the sputum remained scanty, and never acquired the characters of the

*sputum coctum*. He suffered much from severe head-ache, and occasionally from sickness after coughing. He had frequent accessions of orthopnœa, which lasted continuously for several days together; and he had, also, until shortly before his discharge, almost nightly attacks of asthmatic breathing. These usually supervened about half-past four o'clock in the morning, but also sometimes at an earlier hour. When this occurred he still commonly had an attack at the usual hour likewise. Dry sounds were always heard more or less on auscultation. Occasionally crepitation was also heard in the base of one or other lung, but it was never of long duration nor very marked. The treatment was modified according to the necessities of the patient, but I may mention that he derived much relief, as regarded the nightly asthmatic paroxysms, from the internal administration of nitrite of amyl, in doses of two minims, combined with syrup of tolu and mucilage of acacia. Sometimes it was necessary to repeat the dose at the expiration of twenty minutes, but this never failed to relieve the breathing. The orthopnœa was much relieved by ether inhalations, used at intervals of four or six hours, according to the severity of the attack.

I now turn to the notes of another case of emphysema, in which there was no history either of gout or of any other constitutional disease, the emphysema appearing to have been developed only after severe and repeated attacks of bronchitis.

CASE 62.—Helen B., aged forty-nine years, a married woman, became an out-patient of the hospital, under my care, on February 16, 1866. Her father had died asthmatical at the age of forty-two; her mother and two sisters were living and in good health. She had never suffered either from gout or rheumatism, nor was there any history of their existence in her family. For six years past she had suffered regularly

from winter cough ; which, in the first instance, was induced by attending at night upon a consumptive friend without proper precautions against taking cold. She had previously enjoyed good health ; and since that time she had usually been well and free from cough during the summer, until the year previous to her admission under my care, during which she had never lost her cough, and had begun to suffer continuously from shortness of breath.

On admission her pulse was quiet, and skin cool. The respiration was laboured ; the cough exceedingly troublesome ; and the expectoration generally thick and white, but occasionally streaked or specked with blood. The chest was everywhere resonant on percussion. Bronchitic sounds were heard more or less over both lungs, and the sound of expiration was prolonged and distinctly audible. The patient continued to attend for several weeks, and became much more comfortable, as regarded both the cough and dyspnoea.

On April 7, however, she was admitted into the hospital for a fresh attack of bronchitis. On admission, her lips were rather livid, and the cough and dyspnoea were very urgent. The pulse was 100, and very feeble ; the patient had a languid, exhausted aspect, and complained much of weakness and of inability for exertion. The chest expanded imperfectly ; being, for the most part, simply elevated during inspiration by strong and well-pronounced action of the cervical muscles. The thorax was resonant on percussion from apex to base, and comparatively so even over the præcordia ; it was also abnormally resonant over the back, excepting over the base of the right lung. The impulse of the heart could be neither seen nor felt in its normal situation, and respiratory sounds were heard over the cardiac region. The heart-sounds were free from murmur. Rhonchus, sibilus, and moist sounds were abundantly audible over both lungs. The cough was hard, dry, and exceedingly troublesome, and the expect-

toration was very scanty. The urine was acid, specific gravity, 1018, and not albuminous.

I ordered a hot linseed-meal and mustard poultice to be applied over both the front and back of the thorax ; a draught containing 1 ounce of infusion of senega, 15 minims of tincture of squill, 4 grains of carbonate of ammonia, with 5 minims of wine of ipecacuanha, and 20 minims of tincture of henbane, to be taken every six hours ; and 5 grains of compound pill of hemlock, every night at bedtime. I also ordered her a liberal diet of eggs, beef-tea, and milk, with 6 ounces of brandy in the twenty-four hours. Under this treatment the cough became looser and less troublesome, and the expectoration much more abundant, somewhat opaque, and occasionally streaked with blood.

On April 30, the patient was noted as decidedly improving, and as sleeping quietly for several hours at night ; but the respiration continued very laborious. The epigastrium and lower costal regions below the fifth rib, the lower part of the sternum, and also the lower posterior part of the thorax, were drawn inwards during the act of inspiration ; the lower part of the abdomen, on the contrary, was protruded. Rhonchus and sibilus were heard over the whole chest ; moist crepitation in the bases of the lungs only. The pulse was 70, small and compressible. The fits of coughing were long, and the patient was expectorating much opaque, adhesive mucus, chiefly of a yellowish, but sometimes also of a slightly rusty hue.

On May 11, the pulse was only 60, very small and compressible ; the cough had become much less troublesome ; the respiration less laborious ; and, with the exception of some faint crepitation in the bases of the lungs, no adventitious sounds were discovered on auscultation. She was now ordered to take  $\frac{1}{2}$  a drachm of the syrup of iodide of iron, three times a day ; and was discharged from the wards. She continued to attend as an out-patient until the month of September,

during which period she continued to take the chalybeate in the daytime, and the hemlock pill at night, and remained free from any accession of bronchitis.

On September 14, she came to inform me that she was about to go to Ireland, when the following last notes of her case were taken:—Pulse, 66, small and feeble; respirations, 24, comparatively tranquil. The sterno-cleido-mastoid muscles were in slight action even in ordinary respiration, and the epigastrium was still retracted during inspiration. The abnormal resonance of the chest remained unabated; no cardiac impulse could be seen or felt. The heart-sounds were distinct and free from murmur, but the first sound was prolonged and accentuated. The respiration was dry and harsh; no moist sounds were anywhere audible; the sound of expiration was much prolonged. The patient considered herself to be much improved, as in truth she was; and said that she had little shortness of breath, excepting in the morning, when she usually had a long abortive fit of coughing, and raised with difficulty a very scanty sputum. During the daytime she had very little cough and no expectoration.

To this case, the term 'bronchitic emphysema' may be applied in the strict sense of the words; for the emphysema, so far as I could ascertain, had undoubtedly resulted from the frequent and severe bronchitic attacks, extending over a period of six years. As might naturally be expected in such circumstances, the emphysema had been developed slowly, and the dyspnoea had been so masked, by the urgent suffering caused by the bronchitis, that the patient had only become conscious of its existence when the emphysema had nearly attained the advanced stage which we witnessed on her admission to the hospital.

I have already said that there were no indications of any gouty or rheumatic tendency in this woman's history, and that her first attack of bronchitis supervened upon a definite

and sufficient exciting cause. But there was one fact in her family history which bears upon the etiology of the bronchitis; and, therefore, indirectly also upon that of the emphysema. She stated that her father had died asthmatical at the age of forty-two. It is possible, therefore, that she may have inherited a tendency to chronic pulmonary disease. Nevertheless, even though we assume that there was an hereditary tendency to bronchitis, it would appear that the development of the emphysema in this patient was the result of the bronchitis, and arose mainly from over-distension of the air-cells during violent and prolonged fits of coughing.

There are some points connected with the mechanism of the respiration in this patient to which I shall briefly revert, after reading you my notes of another case in which the same phenomena were exhibited in a still more marked degree.

CASE 63.—William C., aged fifty-five years, a man of clear florid complexion, a coachman by occupation, was admitted as an out-patient, under my care, on November 10, 1864. He had for many years been subject to cough in winter, but was always comparatively free from it in summer. He had no symptoms of either gout or rheumatism; nor, so far as he was aware, had he any hereditary tendency to either of these complaints, nor to any form of pulmonary disease. For a month previous to his admission he had been suffering from his usual winter cough, attended by a great degree of dyspnœa, and by a thin frothy expectoration, which was occasionally streaked with blood.

On admission, his skin was cool and moist; pulse, 79, of good volume; tongue much furred. The respiration was laborious, the muscles in the front of the neck being in powerful action. The chest was broad and rounded in front, but flattened at the sides. It rose uniformly on the two sides, but expanded imperfectly; and the supra-clavicular spaces were depressed into deep cavities during inspiration.

The chest was resonant on percussion in front, from apex to base, on both sides, even over the præcordia; and also over the posterior bases of both lungs, more especially the left. A dry crepitating sound was heard with inspiration at the third intercostal space on either side, and also rather fine mucous crepitation in the base of the left lung. The expiration was prolonged, and rhonchus was heard in the bases of both lungs. The heart was displaced downwards and inwards; its impulse was only perceptible at the epigastrium, where also its sounds were best heard; they were free from roughness or murmur.

I need not detain you with further details of the case on that occasion; the man improved much under treatment, and was discharged early in the year 1865.

In December of the same year, he presented himself again in the out-patient room, suffering from his former ailments. His breathing was more laborious; not only the muscles of the neck, but the abdominal muscles also, being now actively engaged in assisting the respiratory efforts. The sounds on percussion and auscultation remained much as before.

He again derived benefit from treatment, and kept fairly well during the summer, but never lost the dyspnœa, and applied again for admission in January 1867, when it was obvious that he was suffering from an attack of recent bronchitis engrafted on his chronic ailments, and that his respiration was unusually laborious even for such a condition. On the removal of his dress, the muscles in front of the neck and the abdominal muscles were seen to be in spasmodic action. The chest expanded very little, but was forcibly dragged upwards in front, during the act of inspiration. The lower intercostal spaces were widened, but well marked; and, at the moment of inspiration, the lower ribs were distinctly drawn inwards. At the same moment the epigastrium also receded inwards and upwards in such a manner that the lower margin of the ribs formed a prominent ridge round the front

of the abdomen. The chest was everywhere resonant, both in front and behind. Cooing sounds were heard over the chest, with dry crackling, as before, at the third intercostal spaces, but no moist sounds. The heart-sounds were still normal; the skin cool; tongue clean; pulse, 76, and respirations, 26.

The urgent bronchial symptoms having been first relieved by the use of sedatives and of the senega draught, I gave him syrup of iodide of iron, in combination with small doses of strychnia. He is now in a much less distressing condition, but still suffers from extreme dyspnoea on the slightest exertion; and, indeed, I need scarcely tell you that no treatment can avail in such a case to restore the breathing, even temporarily, to any such state of comparative comfort as that attained by the patient Helen B. (Case 62). The dyspnoea will continue, and will be further aggravated by the fresh attacks of bronchitis from which the man will inevitably suffer on every fresh exposure to winter cold.

You cannot fail to have noticed, in the description of this patient's condition, the perversion of the mechanism of respiration, which existed in his case to an unusual extent, and to which I alluded as exhibited in a less marked degree by Helen B. The lower aperture of the thorax, at the moment of inspiration, appeared to be narrowed; the lower ribs and intercostal spaces, and the epigastrium, being retracted, and the upper part of the abdominal walls shrinking inwards and upwards, so that the margin of the ribs formed a prominent ridge.

In a slighter degree, this occurrence is common in cases of extensive emphysema. The diaphragm, being pressed downwards by the heart and enlarged lungs, becomes flattened, instead of retaining its normal convex shape on the upper surface; and, according to Dr. Stokes, it may even possibly, in extreme cases, become concave. It still continues to contract during inspiration, but the effects of its action become



inverted; for being unable, under the pressure from above, to tighten its lateral wings so as to enlarge the capacity of the thorax, it overpowers the antagonistic muscles, and, acting upon its attachments to the lower ribs and ensiform cartilage, draws them inwards; thus actually contracting, in place of enlarging, the vertical capacity of the thorax, and counter-acting, instead of aiding, the inspiratory efforts.

These phenomena are, however, rare in the extreme degree exhibited by the patient William C.; and I will, therefore, trespass on your attention a few minutes longer, whilst I read to you, very briefly, the notes of two other striking examples of the same perversion of the mechanism of respiration in patients whom several of you have seen in my out-patient room.

CASE 64.—Edward D., aged thirty-nine years, a commercial traveller, came under my care as an out-patient on May 9, 1867. His father had died of heart-disease, at the age of forty-nine. The patient himself had been subject to cough in spring and autumn for many years. Latterly it had continued, with more or less severity, during the whole winter, and had been sometimes attended by extreme dyspnœa, amounting to orthopnœa, during the greater part of the night.

At the time of admission he was pallid and emaciated, and suffered much from dyspnœa on exertion. His chest was large and deep, and somewhat bulging over the back. The respiration was laborious, the muscles of the neck being actively engaged in the process as elevators of the upper ribs. The intercostal spaces were well marked, and the lowermost ones appeared to be widened. At the moment of inspiration, the lower ribs and intercostal spaces, the xiphoid cartilage, the epigastrium, and the flanks, for a short space immediately below the last rib, were drawn inwards; at the same moment, the supra-clavicular regions were depressed.

The breath-sounds were feeble, and vocal vibration was almost wanting in front of the thorax. Rhonchus and sibilus were audible throughout the lower and posterior parts of both lungs. The heart was seen to beat only in the epigastrium; its sounds were clear, but audible only in the epigastrium, and at the right border of the lower part of the sternum.

CASE 65.—James F., aged fifty-six years, stableman, became an out-patient, under my care, on February 1, 1867. He had suffered from rheumatic fever at the age of twenty years, and had frequently, since that time, had rheumatism in a milder form. For the last six or seven years he had been subject to cough and dyspnœa, chiefly, but not exclusively, in winter. During the last few months previous to his admission he had suffered from these complaints in an aggravated degree.

On examination the thorax was found to be everywhere abnormally resonant on percussion. The respiration was harsh, and the expiration prolonged. Rhonchus was audible over the whole front of the chest, and moist crepitating sounds were heard in the lower and posterior parts of both lungs. The impulse and sounds of the heart were felt and heard only at the epigastrium. During inspiration, the lower lateral parts of the chest, the xiphoid cartilage, the epigastrium, and the flanks below the last rib, were forcibly drawn inwards.

Before closing my remarks on this subject, I must read you the notes of another case, in which the effects of emphysema upon the form and movement of the thorax were very striking.

CASE 66.—Francis M., aged twenty-seven years, a labourer, who had been under my care for a short time in December 1864, and again in March 1865, was readmitted as an out-patient at the Middlesex Hospital, October 3, 1865. He stated that, three years before, he had been ill for nearly

six months, and had been confined to bed for many weeks with rheumatic fever, followed by bronchitis. From that time he had seldom been entirely free from cough; but it had each year been less troublesome during the warm weather, until the summer immediately preceding his admission, throughout which it had continued unabated. He had also, after the first year, begun to suffer from shortness of breath.

On admission, he was suffering from extreme dyspnoea; his respiration being very laborious, even when he was quite at rest. The cough was of a wheezy, abortive character, attended by a very scanty expectoration of thin, frothy fluid. The skin was cool; the pulse, 75, feeble; the finger-ends were slightly bulbous. The urine, sp. gr. 1015, was pale-coloured, acid, and free from albumen. On exposing the chest for examination, a few patches of psoriasis were seen upon its anterior surface.

The shoulders were much rounded, so that the scapulæ were brought into an almost horizontal position. The supra-clavicular regions were depressed, and formed cup-like hollows behind the clavicles. The sterno-cleido-mastoid and scalene muscles were in powerful action during inspiration. The expansion of the chest was very deficient, but symmetrical and equal on the two sides. The elevation of the thorax was excessive; the front of it being forcibly raised at once, as if by a sudden jerk, in order to assist the process of inspiration. The thorax was rounded and prominent in front, so as to give it, together with the rounded shoulders, a somewhat globular shape in the upper part; but it was rather contracted than otherwise, below the sixth rib, and flat in the axillary regions.

The note elicited by percussion over the front of the thorax, from the clavicle to the margin of the ribs on either side, and even over the præcordia, was perfectly clear. The percussion resonance was also abnormally clear over the lower

and posterior parts of both lungs. The breathing was spasmodic, and rather quick; the respirations being twenty-six in a minute. In some parts of the lungs the breath-sounds were very feeble; but, more generally, the inspiration was wheezy and sibilant, and the expiration very audible, much prolonged, and of a grave snoring character. The breath-sounds were distinctly audible over the præcordia. Mucous crepitation was heard with inspiration in the bases of both lungs.

The heart was displaced downwards and inwards: its impulse was seen and felt only in the epigastrium, immediately below the xiphoid cartilage, where its sounds were also distinguishable; there was no cardiac murmur. The liver also was displaced downwards: its dulness on percussion commenced somewhat below the normal line, and its border was felt a full inch below the margin of the false ribs. I prescribed a draught, containing 15 minims of tincture of squill, 20 minims of compound tincture of camphor, 5 grains of carbonate of ammonia, and 2 ounces of the infusion of senega, to be taken every six hours; and 5 grains of compound pill of hemlock, to be taken every night.

Under this treatment, the patient at first decidedly improved; but, presuming on the amendment, he exposed himself to inclement weather, and on November 20, in consequence of having taken cold, was even worse than he had been at the time of his admission. The cough was very troublesome, and he was raising a very considerable quantity of transparent, frothy expectoration. The respiration was most laborious: not only the muscles at the front of the neck, but also the lower intercostal and abdominal muscles, being in violent action. Cooing sounds were heard all over the chest; the crepitation in the bases of the lungs was of a drier character than before. The skin continued cool. Five minims of ipecacuanha wine were added to each senega

draught ; a hot linseed-meal poultice was ordered to be kept over the back of the thorax ; and, the urine being perfectly normal, a blister was applied across the upper part of the sternum.

On November 24, the cough had already become less troublesome, except at night ; the expectoration was less copious, and the breathing less gasping and laborious ; the breath-sounds had also slightly improved ; the pulse was 90, and feeble. There being nothing in the case to contraindicate the use of opiates, a quarter of a grain of hydrochlorate of morphia was added to the night pill.

On the 27th, the improvement in the patient's condition was very marked : he had much less cough at night, the dyspnoea was less urgent, and the pulse had fallen to 72.

This amelioration continued for some time, until he again took cold from some fresh exposure : for, notwithstanding the man's distressing condition, as soon as he felt somewhat better, he did many little jobs of out-door work, requiring only slight physical exertion, but involving great risk of taking fresh cold. After the more acute symptoms had subsided, he derived much benefit from taking the tincture of perchloride of iron and diluted hydrochloric acid, sometimes in combination with wine of ipecacuanha and small doses of the solution of hydrochlorate of morphia, and at other times with spirit of chloroform. When at his best, his respiration was laborious, and cooing sounds were always audible in some part or other of the lungs. He was finally lost sight of in the spring, when he considered himself as well as he was likely to become.

This, then, was a characteristic case of general emphysema, in which there is no doubt, from the patient's statement, that the bronchitis had preceded the emphysema, and that the liability to bronchitis dated from the attack of rheumatic fever three years before. As a rule, the rheumatic

poison is prone to attack the fibrous tissues and the serous membranes, rather than the mucous membranes and the skin, which are more commonly affected in gout. Hence, we very commonly find bronchitis and certain cutaneous diseases either co-existing, or alternating with fits of gout; whilst pleurisy, pleuro-pneumonia, pericarditis and endocarditis, are the more frequent complications of acute rheumatism. At the same time, bronchitis does no doubt occur, though more rarely, in this latter disease. I have seen several cases in which a primary attack of general bronchitis co-existed with rheumatic fever, and similar cases have been recorded by Dr. Latham, in his Clinical Lectures, and by Dr. Fuller in his work on Rheumatism. My colleague, Dr. Thompson, had also, some time ago, under his care, a case of rheumatic fever, in which bronchitis in both lungs constituted the more urgent part of the patient's ailments.

I shall now direct your attention to those points of interest in the case which mainly induced me to bring it under your notice, and which render it particularly instructive with reference to the changes produced by emphysema in the form of the chest, and in the mechanism of respiration.

The thorax had acquired, in a very pronounced degree, the somewhat globular form often associated with extensive emphysema, when it has commenced in youth or in early middle life, before the costal cartilages have become ossified and unyielding. This rounded form of the thorax is mainly due to actual dilatation, and is sometimes limited to the anterior walls; but when the emphysema is general, and consequently the dyspnoea severe, and the cough frequent and abortive, the patient is habitually compelled to incline his body forwards and to elevate the shoulders, until the shape of the posterior part of the thorax becomes also permanently altered. The change of shape in the shoulders is further promoted by the habit, which such patients acquire, of resting upon the elbows

during paroxysms of orthopnoea, in order that, the arms being fixed, the muscles of the shoulders and back may be converted into accessory muscles of inspiration.

But although, in these cases, the efforts at inspiration are the most obviously laborious, the difficulty of expiration, consequent upon the loss of contractile power in the lungs, is the real foundation of the patient's sufferings. The act of expiration being inefficiently performed, too large an amount of residual air is left at the close of each expiration in the air-vesicles, which, of course, are thereby rendered unable to admit a sufficient supply of fresh air at each succeeding inspiration. In order to overcome this difficulty, and appease the craving for fresh air, more violent inspiratory efforts are made; and this is more especially the case when, to the loss of elasticity in the pulmonary tissue, is added the impediment to the action of the diaphragm, consequent upon the downward pressure of the over-distended lungs. All the various muscles that can by any means be converted into accessory muscles of inspiration are then brought into powerful action. Accordingly, the sterno-cleido-mastoid muscles were seen in this patient spasmodically assisting the scalene muscles as elevators of the thorax; whilst, as I have already said, the muscles of the shoulders and back were called into play with the same object.

All these manifestations of distress were absent in the other patient, William E. (Case 58), whose history I related in my last lecture: and you will remember that I attributed his comparatively comfortable breathing at ordinary times to the fact that the lungs, although extensively emphysematous, had not displaced the diaphragm downwards, so as to interfere either with the performance of its own proper function of enlarging the capacity of the thorax during inspiration, or with powerful accessory action on the part of the abdominal muscles in expiration. These latter had con-

sequently sufficed to compensate in a great measure, though not without abnormal muscular effort, for the loss of expiratory power in the lungs. In the case now before us the circumstances were very different. Owing, probably, to the rapidity with which the emphysema had attained so great a development, the dilatation of the walls of the thorax had not sufficed to obviate the pressure of the enlarged lungs upon the heart, diaphragm, and liver, which were consequently all displaced downwards in a very marked degree; thus rendering inoperative the means of compensation existing in William E.; and, hence the extreme dyspnoea, and painful inspiratory efforts, exhibited by this patient even when at rest.

In concluding my remarks on pulmonary emphysema, I must remind you that, although for the sake of clearness in explaining the different factors which may produce it, I have been obliged to divide cases of that disease into groups, according to the predominance of one or other of these factors, you will find, in practice, no such sharp lines of distinction. The two factors—degenerative change in the pulmonary tissues, and over-distension of the pulmonary cells by air—may, and do combine, so to speak, in every varying shade of proportion. Although therefore, in occasional cases, such as some of those which I have selected for our study, the action of the one or of the other factor may have been so obviously predominant as to be entitled to rank as the exclusive cause; in the infinitely larger number of cases lying between these extremes, it is often impossible, unless they come under observation in the earlier stage, to determine the precise share which the two factors have respectively contributed to the result.



## LECTURE XIII.

## BRONCHITIS AND DISEASES OF THE HEART.

RELATIONS OF BRONCHITIS WITH DISEASES OF THE HEART—BRONCHITIS A CONSEQUENCE OF DISEASE OF THE LEFT SIDE OF THE HEART; A CAUSE OF DISEASE OF THE RIGHT SIDE OF THE HEART—INCOMPETENCE OF THE MITRAL VALVE A PREDISPOSING CAUSE OF BRONCHITIS: MODE OF ACTION: PULMONARY CONGESTION—SECONDARY RESULTS; GENERAL VENOUS CONGESTION; ALBUMINURIA; ANASARCA; HÆMOPTYSIS; PULMONARY APOPLEXY—EFFECTS OF INCOMPETENCE OF THE MITRAL VALVE IN CAUSING BRONCHITIS, PRIMARILY MECHANICAL—SAME EFFECTS PRODUCED BY CONSTRICTION OF THE MITRAL ORIFICE—ACTION OF MITRAL INCOMPETENCE INDIRECT: OF MITRAL CONSTRICTION DIRECT.

GENTLEMEN,—Until within a few days I have had under my care in Northumberland Ward, two female patients, occupying beds almost opposite to one another, both of whom were suffering from bronchitis associated with disease of the heart. In one of these patients, who is now convalescent, the cardiac disease dates from an attack of rheumatic fever more than two years ago, whilst the bronchitis is comparatively recent. In the other patient, who died a few days ago, the bronchitis had preceded the disease of the heart.

In our convalescent patient, the principal seat of the cardiac lesion is in the left side of the heart; and the incompetency of the mitral valve to prevent the reflux of blood into the left auricle, has been, certainly, at least the predisposing cause of the bronchitis which has become associated with it. In the patient whose illness was fatal, the principal seat of the cardiac lesion was, on the contrary, in the right side of the heart; and the hypertrophy and dilatation of the right ventricle, together with the incompetency of the tri-

cuspid valve to prevent the reflux of blood into the right auricle, were the direct results of the bronchitis and pulmonary emphysema which had preceded them.

This latter condition of heart and lungs was exhibited also, in a very striking degree, by a male patient who died in the hospital under my care in May last; and I shall, therefore, make use of his case as an additional illustration of the subject, and show you the preparations I have preserved for that purpose.

You may remember that, in a former lecture, I told you that bronchitis might stand to disease of the heart in the relation either of cause or of consequence, and I have selected these cases as texts for my clinical lecture to-day, on account of their exemplifying so very clearly the opposite relations between the two diseases.

I shall first read you the notes of our convalescent patient still in Northumberland Ward, in whom the cardiac disease had preceded the bronchitis.

CASE 67.—Lydia P., aged twenty-six years, a single woman, was admitted into the hospital, under my care, on September 10, 1867. In the year 1865 she had been for many weeks an in-patient, under my care, with rheumatic fever; when admitted on that occasion, she had been ill for fourteen days, and there was already a loud systolic murmur audible at the apex of the heart. The case was one of ordinary rheumatic fever with cardiac complication; and, though she left with a damaged heart, she had remained quite free from any pulmonary affection. In March of the present year, however, she was again an inmate of the hospital, under Dr. Thompson's care, for bronchitis and heart-disease. She had another bronchitic attack during the summer, and was suffering in the same manner when readmitted in September.

On this last admission, the patient stated that, from the time of the rheumatic fever, she had experienced difficulty of

breathing in going upstairs or in lifting heavy weights. She was a domestic servant, obliged to be much on her feet, and about a month before her admission, she observed that her legs had become swollen. Nearly at the same time, she had begun to suffer great pain and discomfort in the region of the heart; and, also, increased inconvenience from shortness of breath on exertion. The cough, which had never entirely left her since the last attack of bronchitis, had also become more troublesome, and the expectoration more abundant.

At the time of her admission she was coughing much, and raising a copious frothy expectoration. The lower limbs were very œdematous. The urine, sp. gr. 1026, contained a trace of albumen. The pulse was 80, very weak, and irregular both in force and rhythm. The breathing was laboured, and there was occasional orthopnoea. The chest was quite normally resonant in front; but, posteriorly, there was dulness on percussion, from the middle of the left scapula downwards: a fact which was also noted by Dr. Thompson, when she was under his care in March. The area of cardiac dulness was increased, especially towards the right side; the heart's impulse was diffused, forcible, and heaving; and a loud systolic murmur was heard over the præcordia. This murmur was loudest at the apex of the heart and over the lower third of the sternum, and was also distinctly audible at the lower angle of the left scapula. Expiration was greatly prolonged. Rhonchus and sibilus were heard over the greater part of both lungs posteriorly.

It was quite evident, from the patient's state, that the flow of blood through the lungs was so impeded that the right ventricle of the heart had become first over-distended with blood, and then probably dilated. Hence the increased area of cardiac dulness towards the right side, and the general venous congestion, resulting in albuminuria and œdema of the lower extremities. Neither of these symptoms

had existed previous to the recent attack of bronchitis, and you are aware that at the present moment they have both entirely disappeared: their temporary duration apparently proving their dependence upon a temporary condition.

The impeded flow of blood through the lungs is due, in this and similar cases, to two causes: the one permanent, the other only of temporary duration. The first, and permanent, cause, is the incompetency of the mitral valve, allowing the regurgitation of blood through the auriculo-ventricular orifice during the contraction of the left ventricle; thus over-distending the left auricle, and impeding the flow of blood into it from the lungs. This impediment tends to keep up a constant state of pulmonary congestion; which, in its turn, retards the flow of blood into the lungs from the right ventricle, and tends to create more or less general venous congestion. The other, and temporary cause, is the bronchitis, which, by interfering with the due performance of the respiratory function, increases the already existing impediment to the pulmonary circulation; and, thereby, still further retards the flow of blood out of the right ventricle, and tends to aggravate the venous congestion.

As the albuminuria and anasarca, resulting from the impeded circulation through the right side of the heart, disappeared, in the case we are considering, with the temporary attack of bronchitis, we must consequently presume that the permanent mitral incompetency was insufficient, by itself, to produce the degree of venous congestion which involves these serious results; and, in fact, as you well know, many persons are the subjects of such incompetency during a large portion of their lives without any such consequences.

In our patient, at any rate, these alarming symptoms had only supervened coincidentally with the bronchitis; and it was therefore clearly necessary to direct the treatment, in the first place, towards the removal of that complication; but it

was also most desirable to relieve the venous congestion as soon as possible.

For the attainment of both these objects, similar means were likely to be efficacious; namely, rest in the recumbent posture, and medicines calculated to promote free expectoration and action of the skin. A brisk hydragogue purge would also tend directly to relieve the general venous congestion, and indirectly, likewise, the congestion of the kidneys. I accordingly desired that the patient should remain in bed, and ordered her to have a full dose of compound jalap powder immediately, and a draught, every four hours, consisting of 2 drachms of the solution of acetate of ammonia, 5 minims of antimonial wine, 20 minims of spirit of nitrous ether, and 10 drachms of camphor water.

On the 12th her pulse had fallen to 66, but continued irregular. The cough continued troublesome, and she expectorated a frothy, glairy mucus, speckled with blood. Moist sounds were heard over the back of the chest. The dyspnoea was still distressing, the patient requiring to be constantly propped up in a semi-recumbent position, and sometimes for an hour or two being compelled to sit quite upright, and even to lean forwards, in order to get breath; she also complained much of a sense of tightness across the chest. The oedema of the legs had somewhat abated, and the urine no longer showed any trace of albumen, either with heat or nitric acid: it was high-coloured, sp. gr. 1026, and deposited, on standing, a large quantity of pink lithates. I now ordered her a draught, consisting of solution of acetate of ammonia, spirit of nitrous ether, and tincture of squill, with 20 minims of tincture of henbane and 1 scruple of acetate of potash, every six hours; and directed a linseed and mustard poultice, consisting of ten parts of the former to one of the latter, to be applied over the front of the chest, and renewed every four or five hours.

On the 14th her condition had not improved. She had passed a sleepless night, and still complained of tightness in the chest; her eyes were prominent; her respiration very laborious, and she had almost constant orthopnoea. The cough had not diminished; the expectoration was scanty, glairy, and tenacious. The œdema had very considerably subsided.

During the next two days she varied little; but on the 16th she began to vomit, on which account I gave her the effervescing citrate of potash draught, with 15 minims of tincture of digitalis, and 3 grains of ammonio-citrate of iron every six hours; I also ordered 2 ounces of brandy to be given her, in divided doses, during the day.

On the following morning, September 17, we found that she had slept better, and that her cough was easier, and the expectoration more opaque. Her breathing was, however, very quick, the respirations being upwards of 40 in a minute. Her pulse, which had varied greatly in frequency, was again 66. Mucous crepitation was now audible in the bases of both lungs posteriorly. The œdema of the legs and thighs had almost disappeared, and the urine remained free from albumen. I desired the effervescing draught to be continued, and a pill to be taken nightly, consisting of 5 grains of compound pill of hemlock, and a quarter of a grain of the hydrochlorate of morphia.

She remained for some days in much the same condition, but on the evening of September 20 became worse without any obvious cause. She suffered from constant orthopnoea, and her countenance had an anxious aspect, and a dusky, bloated appearance. The urine again exhibited albumen, in much larger quantity than at first, and she raised a few sputa of bright florid blood. Pulsation was now also visible for the first time in the veins of the neck, being more evident on the right than on the left side: a circumstance which I have observed before in similar cases.

In this instance, I have no doubt that the pulsation was caused by a recoil wave of blood from the right auricle; for the passage of blood downwards from the head being intercepted by gentle pressure on the vein with the finger, the empty vein was seen to fill again from below, in a pulsatory manner, as nearly as possible synchronously with the contraction of the ventricle.

There was now, evidently, incompetency of tricuspid valve and regurgitation of blood into the right auricle during the contraction of the ventricle: a condition which, I explained to you on a former occasion, might be only temporary. No murmur, indeed, was heard, which could be ascribed to the regurgitation of blood through the right auriculo-ventricular orifice; but tricuspid murmurs are much rarer than tricuspid incompetency, for the latter frequently arises from dilatation of the right cavities of the heart, and consequent enlargement of the orifice through which they communicate, so that the blood passes backward without giving rise to any audible sound. You are aware that the same holds good in cases of mitral incompetency; a regurgitant murmur, previously very distinct, becoming inaudible when the left cavities of the heart have become dilated, and sometimes returning again when the condition of the heart has improved. You may probably remember two such cases recently under my care—the one in Founder, the other in Murray Ward—in which this has occurred under the beneficial action of digitalis and iron; the heart's action having become steadier, and the radial pulse improved, at the same time that a mitral regurgitant murmur has developed under our observation. The man in Founder Ward had been previously under the care, successively, both of Dr. Thompson and myself, and a systolic murmur at the apex of the heart had been on each occasion detected.

Again, the reappearance of albumen in the urine in so

considerable a quantity was a proof of congestion of the kidneys, such as might arise from engorgement of the systemic capillaries, consequent upon incompetency of the tricuspid valve. On the other hand, the hæmoptysis could only be indirectly, if at all, ascribed to this cause, for it was indicative of pulmonary congestion; and, as you are aware, obstruction to the flow of blood through the right side of the heart tends rather to prevent than to promote congestion of the lungs. The pulmonary congestion in this case was of course mainly caused by the incompetency of the mitral valve, which retarded the flow of blood from the lungs into the left auricle; but it is also certain that the increased bronchial irritation was another factor in its causation; and, lastly, it is quite conceivable that the engorgement of the systemic capillaries, reacting backwards, and tending to check the current of blood passing through the aorta, may have conduced to the same result.

Meantime, the patient began to improve decidedly after the hæmoptysis, as though the hæmorrhage had relieved the congestion of the pulmonary capillaries. Only a few years ago, a patient in the condition of this woman would have been bled as a matter of course; and, I have little doubt, with at least great temporary benefit. I have myself sometimes employed a moderate venesection, with much advantage, in pulmonary congestion consequent upon disease of the left side of the heart; in the present case, however, such manifest and speedy improvement followed the hæmorrhage from the lungs that the question of taking blood, even by leeches, did not arise.

The citrate of iron was now omitted from the effervescing draught, and 5 minims of wine of ipecacuanha, and 30 minims of tincture of henbane were added to it. The night pill, from which the patient had derived much comfort, was continued.



On September 26, the cough had become less troublesome, and the expectoration was scanty, transparent, and streaked with black carbonaceous-looking matter. The orthopnœa had subsided, and the breathing was somewhat easier. The pulsation in the veins of the neck was no longer visible. The urine was free from albumen.

On October 1, she had passed a good night, was coughing much less, and had raised scarcely any expectoration. The pulse was 69, irregular both in rhythm and force. The systolic murmur was still distinct at the left apex of the heart, but it faded towards the base, and was less extensively heard over the cardiac region than at the time of the patient's admission; it was just audible over the lower third of the sternum. The respiration was harsh and sibilant; expiration prolonged; no moist sounds were heard. I desired the night opiate to be omitted, and prescribed a draught, containing 15 minims of tincture of digitalis, and 10 minims each of diluted hydrochloric acid, tincture of perchloride of iron, and spirit of chloroform, in 1½ ounce of water, to be taken three times a day.

During the three weeks which have since elapsed the patient has made rapid progress. The expectoration has ceased, and the cough has greatly abated; the œdema has entirely disappeared; the urine has continued free from albumen, and also from any excess of lithates. The pulse has become stationary at about 72, and much more regular; the breathing is less laborious, and the respirations have fallen to 23 in a minute. The systolic murmur is fainter, and entirely infra-mammary, and the patient will be discharged convalescent on Tuesday next.

Here, then, is a case in which disease of the left side of the heart produced, at least, a strong predisposition to bronchitis, in a patient not previously subject to that complaint; and when bronchitis did occur, protracted its course and

added greatly to its danger. The patient has indeed, at length, in a great measure recovered from her recent attack; but the same predisposing cause remains in operation, and the bronchial membrane, being left in a delicate state, will be even more prone than before to take on the inflammatory process. Possibly, also, some permanent nutritive change in the lungs, kidneys, or heart, may have resulted from this last illness.

In any circumstances, an attack of bronchitis, when complicated with disease of the mitral valve, is an incident of very serious import as regards the future prospects of a patient; but it is doubly so in a person who, like our patient, has to work for her livelihood, and cannot escape from inclement weather.

The mode in which the cardiac lesion, in such cases, tends to produce bronchitis, and certain other pulmonary ailments to which I shall presently advert, is primarily mechanical. The regurgitation of blood into the left auricle during the contraction of the ventricle, consequent on the imperfect closure of the auriculo-ventricular orifice, keeps the auricle over-distended, and impedes the entrance of blood into it from the pulmonary veins. Hence arises a condition of chronic congestion of the pulmonary capillaries, which may perhaps in itself constitute such a predisposition for bronchitis that very slight external causes may suffice to excite it; but which, more probably, creates this predisposition indirectly, by altering the nutrition of the bronchial membrane.

Sometimes, as you are aware, this state of chronic congestion gives rise to bronchorrhœa, a copious watery secretion from the bronchial surface. At other times, as in the case of Lydia P., it produces an attack of hæmoptysis; and again in some cases it results in pulmonary apoplexy. All these last-named consequences of congestion of the pulmo-

nary capillaries are more liable to happen in conjunction with bronchitis; that disease contributing to induce them by aggravating the obstruction to the circulation through the lungs. I need scarcely say that the supervention of the third of these conditions on the bronchitis, adds greatly to the gravity of the case and to the probability of a suddenly fatal termination.

I had under my care during last winter a private patient whose case bears so strongly upon the subject we are now considering, that I shall read you a brief abstract of it. Such cases are, indeed, common enough, but that I refer to was under my observation for several years, during which the symptoms underwent various changes and alternations, until at length the patient died from the secondary consequences of impeded pulmonary circulation.

CASE 68.—Mrs. R. N., aged forty-eight years, first consulted me in the early winter of 1867. She had long been the subject of mitral regurgitant disease, and had suffered for several winters from bronchitis. She had had a more than usually severe attack in the previous winter, from which she had recovered, and had remained fairly well during the summer. With the commencement of cold weather her complaint had returned. When I first saw her the symptoms were purely those of bronchitis; the skin was cool, the pulse rarely exceeded 72, and was quite regular; the urine was normal, and there was no œdema of the lower extremities. The chest was normally resonant on percussion; sibilus and rhonchus were heard over both lungs. The cough was troublesome; the expectoration thick, tenacious, and imperfectly aerated. There was much dyspnoea on exertion, the respiration was laborious and rather quick, and the patient frequently suffered from orthopnoea at night, but was able to be up and leave her bed-room in the daytime.

This case was very tedious, as such cases almost invariably

are, and during many weeks my patient made little progress ; any ground gained one week being often lost during the next, and, sometimes, without any obvious cause. At length in February the lungs became œdematous, the ankles swelled towards night, and the urine began to contain a considerable quantity of albumen. The expectoration continued of the same character as at first, but was specked at times with florid blood ; and, on a few occasions, single masses of sputum had a rusty hue. These were alarming symptoms, indicating a tendency both to dropsical effusion and to pulmonary apoplexy, and made me apprehensive as to the result. I prescribed a draught, to be taken every six hours, containing 1 scruple of acetate of potash, 2 drachms of the solution of acetate of ammonia, 20 minims each of the tinctures of squill and digitalis and of spirit of nitrous ether, in 9 drachms of camphor water. Under this treatment the secretion of urine greatly increased and the œdema rapidly subsided. I then gave her, with great advantage, tincture of digitalis in combination with the tincture of perchloride of iron, and a hemlock and morphia pill at bedtime to allay the cough.

In the course of three weeks the patient became very much better ; the cough abated, the blood disappeared from the expectoration, the urine ceased to show any trace of albumen, and she was able to be removed to Hastings. There she passed the colder months of spring, and returned home towards the end of May, so much improved that she could move about with comfort on level ground. The incompetency of the mitral valve and the consequent tendency to a recurrence of bronchitis on the first occasion of her taking cold, however, remained ; and, as I have already informed you, her complaint eventually proved fatal, though not until the lapse of several years and repeated recurrences of bronchitis accompanied by albuminuria and anasarca. Towards the end of her life, symptoms of dilated heart supervened.

In the cases which have thus far occupied our attention, the obstruction to the flow of blood through the left ventricle was caused by incompetency of the mitral valve. This is an exceedingly common cardiac lesion, and it would be easy to multiply examples in which it has been obviously the predisposing cause of bronchitis. But as the effects of this lesion are, in the first place, at least purely mechanical, it follows, of course, that any other cardiac lesion which in like manner impedes the flow of blood through the left side of the heart, and thereby retards its exit from the lungs, will equally tend to produce pulmonary congestion, and to create a predisposition for bronchitis. Constriction of the mitral orifice does, in fact, produce precisely the same effects upon the pulmonary circulation as incompetence of the mitral valve, although the action of the one is direct, and of the other indirect. Incompetence of the mitral valve causes obstruction to the pulmonary circulation indirectly, by allowing a backward flow of blood into the left auricle during the contraction of the ventricle. Constriction of the mitral orifice, on the contrary, obstructs the pulmonary circulation directly, by presenting an impediment to the onward flow of blood out of the left auricle into the ventricle. Of these two lesions, the former is the more common, but we had lately in Murray Ward a patient who has been also under my care on two former occasions for bronchitis associated with this cardiac lesion.

CASE 69.—Sarah K., aged forty-eight years, a married woman, was admitted into Murray Ward on December 29, 1876. She stated that she had been subject to cough in winter as long as she could remember, and had also suffered from shortness of breath, which was frequently worse at night when in bed. About a month before her admission she had contracted her usual winter cough, and became very short of breath, especially on making any exertion and when lying

down. The cough was short and dry, being unaccompanied by expectoration.

On admission she had an anæmic aspect and a somewhat dusky complexion. Her feet and legs were swollen as high as the knees. The expansion of the chest was fairly normal, and percussion yielded a clear, but not too clear, resonance. On auscultation, rhonchus and sibilus were heard over the front of both lungs; crepitation in the lower and posterior parts. The expiration was prolonged and sibilant. The heart's action was irregular, and a systolic murmur was heard outside and below the left nipple; it was also audible in the axilla and at the lower angle of the scapula. A distinct, rough, præ-systolic murmur, accompanied by a thrill, was also heard inside the left nipple. The liver extended below the costal arch; the urine, sp. gr. 1018, presented a distinct trace of albumen. Pulse, 112, feeble; temperature, 98.2°. On microscopical examination neither blood nor tube-casts were found in the urine.

She was purged with compound jalap powder, and took a draught consisting of tincture of squill, ammonia, and spirit of nitrous ether, with an occasional dose of ether and aromatic spirit of ammonia, when the breathing was very distressed. In a few days the sputum, at first very scanty, transparent, and tenacious, became looser, more copious, and mucopurulent; the œdema of the lower limbs subsided; the albumen disappeared from the urine, and she was discharged in a comparatively comfortable state on December 29. The systolic and præ-systolic murmurs were, indeed, still audible, but they were much less pronounced than on the patient's admission into the hospital, and the action of the heart was quite regular. There still, however, was scanty crepitation in the bases of the lungs, and the respiration was easily hurried.

In reference to this case I beg you to note the great im-

provement in the symptoms of general disorder which took place as soon as the bronchitis subsided. The œdema and albuminuria disappeared, and the heart's action, previously irregular and embarrassed, became regular. The cardiac murmurs, also, became less pronounced, though the lesions which gave rise to them remained. The heart, barely able to carry on the circulation at ordinary times, had become so embarrassed by the additional obstruction occasioned by the bronchitis that venous congestion and its results had supervened and disappeared again with the removal of their immediate cause. The case belongs to a class in which much may be done by medical art to relieve, at least temporarily, the more urgent symptoms, and greatly to prolong life.

The mitral narrowing was complicated with mitral incompetency in the case which we have just been considering. I will now read you the notes of a case in which mitral narrowing existed alone and in which the condition diagnosed during life was verified at the post-mortem examination.

CASE 70.—Charlotte F., aged forty years, a married woman, was admitted into Murray Ward, under the care of my colleague, Dr. Stewart, in November 1865. When she had been in the hospital for some time Dr. Stewart directed my attention to the case as being one in which I would be interested, and I then took the following notes:—

Her family history was satisfactory, with the exception of the death of her mother at thirty-four, of decline. She was herself very pallid-looking, and stated that she had long experienced shortness of breath on exertion. She had first suffered from bronchitis eight or nine years before her admission into the hospital, and from that time had had frequent attacks, though rarely severe enough to confine her to the house for more than a few days altogether. During one of the more recent of these attacks her feet had swelled for several successive days, and her face had occasionally been puffy in

the morning after she had suffered much from dyspnoea during the night. She had also at times had palpitation of the heart, especially when walking or going up stairs, and had suffered more from it of late. She had been better than usual during the summer previous to her admission, but had taken cold early in October, which brought on her cough and laid her up for a time. When she began to move about, she noticed that her ankles were œdematous, and, presently, her legs also swelled. She had several times noticed that her expectoration was streaked with blood.

On December 15, when I first examined her, she had a dry, noisy cough, attended by very scanty expectoration. Her face was puffy, and her hands, feet, and legs were very œdematous, pitting deeply on pressure. Her pulse was 102, feeble and compressible; the respirations were quick and very laborious; urine high coloured, sp. gr. 1030, loaded with lithates and copiously albuminous. The respiration was for the most part dry, and accompanied by loud rhonchus and sibilus, but there were some moist sounds in the base of left lung. A loud, rough, præ-systolic murmur was heard below the left mamma. Its point of greatest intensity was close to the right border of the left nipple, and it was more faintly heard over the præcordia, and in the axilla, where it had a musical tone; it was not audible behind. Both cardiac sounds were clear at the aortic and pulmonary orifices, but the second sound was much accentuated in the latter situation.

The patient gradually sank, and died on December 22. Towards the end of life the quantity of albumen in the urine decreased, and the pulse acquired an intermitting character.

At the post-mortem examination, the lungs were found much congested, and presented scattered patches of pulmonary apoplexy. There was effusion into both pleural cavities, and the lower lobes of both lungs were carnified. The



heart was enlarged, and the right cavities were dilated, especially the auricle; the right ventricle was much hypertrophied, its walls being four lines in thickness. The tricuspid orifice was small, barely admitting two fingers. The left auricle was much dilated; the ventricle of moderate size. The edges of the mitral valve were enormously thickened, and the orifice so small that it would scarcely admit the tip of the little finger. The surface of the liver was uneven, its capsule was much thickened, and it had, on section, a nutmeg appearance; the kidneys were normal.

In this case the mitral constriction produced, as you have seen, the same results as did the mitral incompetency in the first cases I have described to-day: that is to say, hyperæmia of the lungs, and predisposition, at least, for bronchitis. The patient had in fact suffered from repeated attacks of bronchitis, during a period extending over many years; until, at length, the combined cardiac and pulmonary diseases had given rise to venous congestion and its consequences.

Moreover, serious secondary changes had in the meantime taken place in the heart itself. The long-continued impediment to the flow of blood from the lungs through the left side of the heart, caused by the narrowing of the mitral orifice, had checked, in a corresponding degree, the flow of blood towards the lungs, through the right side of the heart. This check to the onward current of the blood had, of course, retarded its exit from the right ventricle, which thereby became excited to increased activity in order to overcome the obstruction. The natural consequence of such overaction ensued, and the right ventricle became, as we have seen, much hypertrophied. It being, however, impossible to overcome the impediment to the onward current of blood presented by the narrowed mitral orifice, the backward pressure of the stream distended and gradually dilated both

auricles; and eventually also, though to a less degree, the right ventricle.

Finally, as a result of these changes in the heart, the mechanical hyperæmia of the lungs had, during the patient's last illness, produced the scattered patches of pulmonary apoplexy found at the post-mortem examination.

We have thus pretty fully considered the first of the two relations set forth, at the beginning of this lecture, as subsisting between bronchitis and disease of the heart; namely, that in which the primary cardiac lesion is seated in the left side of the heart, and is, at least, the predisposing cause of the bronchitis which it precedes. I find that time will not allow of my entering to-day on the subject of the opposite relation between the two diseases, that namely, in which bronchitis precedes and directly produces disease of the right side of the heart, and I must, therefore, defer its consideration until a future occasion.

## LECTURE XIV.

BRONCHITIS AND DISEASE OF THE RIGHT SIDE OF THE  
HEART.

DISEASE OF THE RIGHT SIDE OF THE HEART A CONSEQUENCE OF BRONCHITIS AND EMPHYSEMA—HYPERTROPHY OF THE WALL OF THE RIGHT VENTRICLE—DILATATION OF THE RIGHT CAVITIES—ORIGIN OF HYPERTROPHY IN THE EFFORTS OF THE RIGHT VENTRICLE TO OVERCOME THE OBSTRUCTION TO THE PULMONARY CIRCULATION—ORIGIN OF DILATATION IN OVER-DISTENSION OF THE CAVITIES ARISING FROM THE INABILITY OF THE VENTRICLE TO DRIVE THE BLOOD FORWARD INTO THE LUNGS—RESULTS OF DILATATION OF THE RIGHT SIDE OF THE HEART: VENOUS CONGESTION AND ITS CONSEQUENCES—BRONCHITIS OFTEN SECONDARY TO OTHER DISEASES: NO CONSEQUENT CHANGE IN RELATION OF BRONCHITIS AND EMPHYSEMA TO DISEASE OF THE RIGHT SIDE OF THE HEART.

GENTLEMEN,—Let me invite your attention to-day to the two cases to which I alluded at the commencement of my last lecture, as exemplifying the second of the two relations there set forth between bronchitis and disease of the heart. You doubtless remember that in all the cases I read to you on that occasion, as illustrations of bronchitis consequent upon heart-disease, the primary cardiac lesion was seated in the left side of the heart: whereas, in the cases I am about to bring before you to-day, as examples of heart-disease caused by bronchitis and emphysema, you will find that the principal seat of the cardiac lesion was, on the contrary, in the right side of the heart.

We will take first in order the case which occurred first in time, and which affords, perhaps, the best contrast to the cases already discussed, on account of the absence of any but

the pulmonary and cardiac diseases whose mutual relations it is my present object to elucidate.

CASE 71.—Harry A., aged fifty years, a bricklayer by occupation, who had been in early life a prize-fighter, was admitted into the hospital on May 13, 1867, under the care of Dr. Thompson, who kindly transferred the case to me as one of a class in which I was interested.

The family history of the patient was satisfactory, there being no hereditary tendency to gout, rheumatism, or phthisis, and both his parents having lived to upwards of eighty years of age.

The man himself, as might have been expected from his early occupation, had led an irregular life, and had at one time taken both gin and beer in excess. He had also been careless of his health, exposing himself much to the weather, and habitually allowing his outer garments, when wet, to dry upon him. From the age of twenty-four he had been for several years almost constantly in training, and repeatedly entered the ring, but quitted it finally at about the age of thirty, without ever having sustained any serious injury.

Until five or six years before his admission into the hospital he had been a healthy man, but he then took cold, and was attacked by cough, which lasted for several weeks. Every subsequent winter he had had similar attacks, which were attended by slight dyspnoea, and latterly also by palpitation; but both these symptoms always subsided with the cough. The palpitation came on chiefly at night, and was always worst when he had been drinking.

The illness for which he was admitted into the hospital had begun, about the previous Christmas, as an ordinary catarrh, with aching of the back and limbs, followed by his usual winter cough. The dyspnoea and palpitation had then become more severe than on any previous occasion, and he had for the first time been incapacitated for work. He had,

however, been able to go out occasionally until within three weeks of his admission, when the cough and dyspnoea had suddenly become much aggravated, and the expectoration much more copious. Since that time he had been confined to the house, and his difficulty of breathing had latterly increased to such an extent as to compel him to be propped up in bed.

On admission, the patient's face was dusky, his lips and tongue were purple, and his eyes prominent. His chest was rounded in front and flat at the sides, generally very resonant on percussion, and comparatively so even over the præcordia. The resonance was less marked below the right than below the left clavicle, and there was an ill-defined area of comparative dulness at the third right costal interspace. There was very little either of expansion or elevation of the thorax, even when the patient breathed forcibly, and the deficiency of expansion was most marked on the right side. The diaphragm appeared to act freely, and the respiration was chiefly abdominal. The lower intercostal spaces were well marked, widened, and forcibly drawn inwards during the act of inspiration.

Loud snoring and creaking rhonchus was heard in the chest both in front and behind, having here and there, more especially in the base of the right lung, a moister character. The heart's impulse was faintly visible about two inches below the nipple, and there was slight cardiac dulness from the sixth interspace downwards.

The pulse was 96; the respirations were 30 in the minute; the heart-sounds were free from murmur. The skin was cool; the cough not very troublesome; the expectoration frothy, but mixed with opaque greenish or yellowish masses. There had been no hæmoptysis. The urine was scanty, acid, sp. gr. 1012, not albuminous. The patient complained chiefly of loss of appetite and of weakness and

shortness of breath; he suffered so much from orthopnoea that he could never lie down, but sat constantly propped up in bed.

From the time of his admission he rapidly declined; his breathing became more and more oppressed; his pulse rose to 120; and he died on the night of May 18.

On post-mortem examination, the right lung was found to be perfectly free from adhesions; it was, as you see in the preparation before you, of very large size. On the anterior surface of the middle and upper lobes a patch of the pulmonary pleura, about  $2\frac{1}{2}$  inches in diameter, was much thickened, opaque, and puckered in the centre. There was a similar but much smaller patch a little higher up on the same lung.

The pulmonary tissue corresponding to these patches is, as you may see, to a considerable depth, consolidated, dense, and of a bluish-slate colour, but smooth on section, and traversed by numerous white fibrous bands which pass into it from the thickened pleura. Its appearance corresponds very closely with that described by Rokitansky as interstitial pneumonia, and, by other writers, as fibroid degeneration of the lungs. The walls of the smaller bronchial tubes in this consolidated portion of the pulmonary parenchyma are much thickened, and the orifices gaped when the tubes were cut across. They were filled with puriform mucus, and their lining membrane was much congested. The white fibrous bands extended beyond the consolidated portion of the lung, but became finer and less obvious as they spread into the crepitant lung-tissue. The lung-tissue was everywhere of a dark colour and was generally emphysematous, but without presenting any distinct bullæ.

The left lung, which I have not preserved, was almost everywhere adherent, and was much smaller than the right. It was not consolidated in any part, and the pulmonary pleura

was not thickened, but the lung-tissue was traversed by fine white lines identical in character with those observed in the crepitant parts of the right lung. Both lungs were very œdematous.

You will observe that the heart is also very much enlarged. The right cavities are considerably dilated, and the apex of the organ is formed by the right ventricle; the valves are healthy, with the exception of some small patches of atheroma on the base of the mitral valve.

The extensive adhesions of the left lung, and the patch of thickened pleura over the right lung, which were revealed in this case by the post-mortem examination, showed that the disease had not, in the first instance, been simply bronchitis. At some long antecedent time, probably coincident with the first attack of bronchitis, five or six years before death, the patient had evidently suffered from extensive pleurisy of the left side, and also from a more limited pleurisy of the right side. On this latter side the inflammation would seem to have spread inwards, along the interstitial connective tissue of the lungs, producing the consolidation of the neighbouring lung-substance and also the white fibrous bands with which the lung was intersected.

But although it was unquestionable, from these appearances, that pleurisy had existed at some previous time, the bronchitis and emphysema not only were the most important, but had certainly been, for a considerable period before the man's death, the only active pulmonary ailments.

As I have pointed out to you on many occasions, some persons have repeated attacks of severe bronchitis without the appearance of any symptoms of pulmonary emphysema; whilst, in other persons, emphysema becomes developed as a consequence of comparatively mild bronchitis. In this latter class of cases there must undoubtedly exist a special predisposition to emphysema, consisting in a loss of tone in the

walls of the air-vesicles, which disables them from resisting even moderate degrees of distension.

This I regard as having been the condition of lungs in the patient whose case we are now considering. In whatever degrees, respectively, the man's intemperate habits and the chronic inflammation spreading inwards from the pleura had combined to damage the nutrition of the lungs, the result had been such a predisposition to emphysema, that it had become developed to a very great extent in the right lung, and to a considerable extent in the left lung also; although, until his last illness, the patient had never suffered severely enough from bronchitis to have been laid up by it.

I may observe, by the way, that this case is one of many that have fallen under my observation which appear to me to afford conclusive evidence against the theory that pulmonary emphysema is, for the most part, the mechanical result of collapse of one portion of the lung and of complementary distension of other portions to fill the vacant space. There was, it is true, an inconsiderable degree of collapse, or rather contraction, of the consolidated part of the right lung, but the volume of the remainder of the lung was increased enormously beyond its natural size, and out of all proportion to the diminution in bulk of the contracted part; and this would certainly not have occurred if the emphysema had been merely the result of complementary expansion.

The enlargement of the heart was chiefly due to hypertrophy of the wall and dilatation of the cavities of the right side, which had reached such an extent that the wall of the right ventricle was almost as thick as that of the left, and the apex of the organ was formed by the right ventricle instead of by the left. The left side of the heart, however, was also somewhat hypertrophied, though in a comparatively small degree. The hypertrophy had obviously originated on the right side, as a direct consequence of the impediment to



the circulation of blood through the lungs created by the bronchitis and emphysema.

The first result of this impeded entrance of the blood into the pulmonary capillaries would necessarily be, as I have explained on former occasions, its retarded flow out of the right ventricle, leading to over-distension of that cavity, and subsequently also of the auricle on the same side. This over-distension would excite the ventricle to increased activity; and hence, in accordance with the law that the size of muscles increases in proportion to their exercise, the right ventricle had eventually become so much hypertrophied.

Each successive attack of bronchitis would, by aggravating the pulmonary obstruction, tend for the time of its duration still more to overload the right cavities of the heart with blood, until at length their walls would yield to the distension, and dilatation would take place, as it had done in the case before us. Accordingly our patient stated that, during each successive attack of bronchitis, he had suffered more and more from dyspnoea, and latterly from palpitation likewise—symptoms which were indicative of the progress of both the emphysema and the heart-disease. The history of this patient thus shows as clearly the process by which bronchitis often produces disease of the right side of the heart as the cases I related in my last lecture showed the process by which disease of the left side of the heart may produce bronchitis.

Before turning to the other case, to which I referred in my last lecture, I will read you the notes of a case that was in the hospital last summer. I do so both because it affords a good illustration of the effects of dilatation of the right side of the heart upon the general circulation, and also of the beneficial results, in such cases, of the combination of digitalis and tincture of perchloride of iron, of which I spoke on a former occasion.

CASE 72.—Francis A., aged sixty-five years, a painter by trade, was admitted on June 13, 1876. The patient's family history was good, his parents having lived to very advanced ages, and none of his immediate relatives having suffered from pulmonary disease. He stated that he had himself been of temperate habits, and perfectly healthy until he took cold at work in October 1875, when he experienced a sense of tightness in the chest, and began to cough and expectorate. The cough continued to get worse until Christmas, about which time he felt oppression at the præcordia, and spat a small quantity of bright red blood. He also at the same time noticed that his feet and ankles were swollen. Before long the swelling extended to the knees, and his eyes became puffy.

On admission, the pulse was 68, and very irregular both in force and rhythm; the temperature was 97.6°. The face was pallid, puffy, and somewhat livid; the conjunctivæ were œdematous, and both lower limbs were swollen as high as the middle of the thighs, and pitted deeply on pressure. The liver extended 3½ inches below the costal arch; its margin was well defined, and it was tender on pressure. The area of præcordial dulness measured 4½ inches transversely from the middle of the sternum outwards, on a level with the nipple, and only 2½ inches from the fourth rib downwards. There was a systolic murmur at the apex of the heart, which beat outside the nipple, and a similar murmur at the right side of the sternum. The veins of the neck and thorax were much distended.

The chest was resonant on percussion over both the back and front; the breath-sounds were generally harsh; the expiration was prolonged. Crepitation was heard in the lower and posterior parts of both lungs. The breathing was laborious, and the cough troublesome and abortive. The urine, sp. gr. 1022, acid, contained one-eighth of albumen. He was ordered

at first to take a draught of ether, aromatic spirit of ammonia, syrup of tolu and water, every four hours.

During the next few days the breathing continued much oppressed and the cough troublesome, especially at night. The heart's action continued irregular, and the pulse slow; it rarely exceeded 60, and more commonly ranged from 48 to 54. The respirations were at times as frequent as the pulse, and varied from 40 to 54. Brandy, to the amount of 4 ounces daily, was administered at regular intervals, and he had hydrate of chloral at night to secure sleep.

On June 16 I prescribed 10 minims each of spirit of ether and of the tinctures of digitalis and perchloride of iron, to be taken every six hours in  $1\frac{1}{2}$  ounce of camphor water.

On June 20, the pulse was 94, but still very irregular; the respirations were 46. The cough still continued troublesome, but the breathing was less distressed.

On June 27, the patient said that he felt much better. The pulse was 84, stronger, and more regular. The urine was free from albumen, and otherwise normal.

He now gradually improved. The cough left him; and his breathing became so much easier that he said it was quite well. The urine remained free from albumen, and the action of the heart became regular. He was discharged on July 27.

You will have observed, in following the much abbreviated history of the case which I have just related, that it was a more complicated one than the last. The systolic murmurs indicated the existence both of mitral and tricuspid incompetency. The case was in the latter respect an exceptional one, for it is rare to hear a tricuspid systolic murmur when dilatation of the right cavities of the heart has taken place. Indeed, as you are aware, a mitral regurgitant murmur often disappears when the cavity in which it

is formed becomes dilated. Absence of the murmur in these circumstances is to be explained by the absence of roughness of the surface of the valves over which the blood flows, and the feebleness of the reflux current of blood into the auricle. The mitral regurgitation may very possibly, by the passive hyperæmia which it would occasion, have predisposed the bronchial membrane to become catarrhal; and, as the patient was advanced in life, the muscular structure of the heart may have been already somewhat degenerate and prone to yield to internal pressure, and to undergo dilatation. That dilatation was, nevertheless, the direct result of the bronchitis impeding the circulation through the lungs, and thus causing over-distension of the right cavities of the heart.

I now come to the case of the female patient who died in Northumberland Ward of bronchitis followed by heart-disease.

CASE 73.—Amelia P., aged thirty-eight years, a married woman of intemperate habits, was admitted into the Middlesex Hospital, under my care, on September 30, 1867. She stated that there was no constitutional tendency to disease in her family, and that she had herself until lately been a healthy woman. She had not suffered from either gout or rheumatism in any form.

About eight months before her admission she had taken cold, which gave rise to a chronic cough, attended, from the first, by much shortness of breath on exertion and by frequent orthopnoea at night. The expectoration had varied in character, being sometimes frothy and at other times thick and opaque, but it had never been mixed with blood. Four months before her admission she was suddenly seized, on awaking one morning, with palpitation of the heart, from which she had ever since continued to suffer on making the least exertion, and especially on going up-stairs. Her cough and other ailments had much increased during the last seven

or eight weeks. The urine had been high-coloured and usually scanty throughout her illness, and it had often deposited a red sediment.

On admission, she complained chiefly of dyspnœa and palpitation, and of a sense of tightness in the chest. Even the slight exertion of walking across the ward brought on extreme breathlessness, with a sense of choking. Her hands and feet were cold. There was no œdema of the lower extremities, and no lividity of countenance. The urine had a sp. gr. of 1020, and contained about a fifteenth part of albumen. The respirations were 42 in a minute; the pulse was 130. The radial arteries were somewhat tortuous and rigid.

Her breathing was laborious, the accessory muscles in the neck being brought into powerful action. The veins of the neck were turgid; they pulsated in a very marked degree, and, on interruption of the supply of blood from above, they filled rapidly by a wave from below. Pulsation was also readily distinguishable in the veins at the bend of the elbow. The chest was abnormally resonant on percussion over the whole front, from the clavicle to the margin of the ribs, excepting in the region of the cardiac dulness; it was also very resonant over the back. Sibilus and rhonchus were audible over both lungs; the respiration was harsh, and the expiration much prolonged.

The area of cardiac dulness was much increased, extending from the fourth to the seventh rib in a vertical direction, and from half an inch outside the left nipple to the left border of the sternum in a horizontal line. The cardiac impulse was diffused and heaving. The apex-beat was most distinctly felt in the sixth costal interspace, an inch on the outside of a line drawn vertically through the nipple; but the heart's impulse was also both seen and felt at the margin of the ribs on the left side, and, though much more faintly,

over the intervening space. A distinct thrill was felt with the impulse on applying the flat hand over the apex of the heart. There was likewise tenderness on pressure over the præcordia. The heart-sounds were clear; the first was somewhat prolonged and the second accentuated.

I prescribed a draught with 10 minims each of the tinctures of stramonium and squill, and 20 minims of tincture of henbane, to be taken every six hours. A linseed-meal poultice was applied over the back of the thorax, and ordered to be renewed from time to time. The patient was put upon a nourishing diet, with half an ounce of brandy every six hours.

On October 1, we found that she had suffered all night from orthopnoea, and at the time of my visit she was sitting up in bed, leaning forwards and somewhat inclined towards the right side. She had frequent abortive cough, with scarcely any expectoration. The respirations were less frequent, being 32 in a minute, but the breathing was laborious, and the lower ribs and epigastrium were retracted during inspiration. Crepitation was audible in the bases of both lungs posteriorly.

Next day she was expectorating more freely a frothy sputum, and, being still much distressed at night, was ordered to take at bed-time 5 grains of compound pill of hemlock with a quarter of a grain of hydrochlorate of morphia.

On October 7, she reported herself as much better. Her pulse was 108, and her breathing manifestly easier; the respirations were 30 in a minute. Neither sibilus nor moist sounds were audible; rhonchus was still heard. She was discharged this day, at her earnest desire, on account of urgent business matters.

On October 24, she was readmitted into the hospital. Her aspect was now distressed and anxious, her breathing laboured, short, and gasping, and she had constant orthopnoea.

She complained much of pain and tenderness in the epigastrium. Her cough was frequent and abortive, the expectoration scanty, glairy, and tenacious. Sibilus and rhonchus were heard over the greater part of both lungs. Pleuritic friction sound was perceptible below the right nipple, extending round to the scapula; it was also heard over the centre of the left scapula. There was deficient resonance on percussion in the right mammary region and over both scapulæ.

The area of cardiac dulness was even greater than it had been before the patient left the hospital, and the heart's action was violent and irregular. The heart lay, as before, almost horizontally across the chest, its heaving impulse being plainly visible from the epigastrium to a full inch outside the nipple line.

The pulse was 100, feeble, and irregular. The tongue was furred, and the appetite bad. Very considerable œdema of the lower limbs and trunk had become developed. The urine, sp. gr. 1020, contained a very large proportion of albumen.

I ordered her to take, every four hours, a draught containing 10 minims each of spirit of chloroform and tincture of stramonium, 20 minims of tincture of henbane, and  $1\frac{1}{2}$  ounce of camphor water, and also two pills at night consisting of 4 grains each of camphor and extract of henbane, to be followed in the morning by 2 scruples of compound jalap powder. A linseed-meal and laudanum poultice was also applied over the epigastrium.

It was sufficiently evident that the patient had not only lost ground generally during her absence from the hospital, but that pleurisy as well as bronchitis now existed in both lungs. Accordingly she became rapidly worse; the dyspnœa became more urgent and the breathing more hurried.

On October 29, the respirations were 60 in a minute; they were not only extremely frequent, but they were also peculiar in character. Several short, gasping, ineffective

inspirations seemed to follow each other with great rapidity ; and the expiration being equally incomplete, she suffered at times from paroxysms of almost apnoea, during which the laryngeal muscles were brought into spasmodic action. These rapid respirations were followed at irregular intervals by a fuller, deeper, sighing inspiration, which afforded momentary relief.

She now complained frequently of faintness and of a sensation of choking. The urine showed an increase in the proportion of albumen to fully one-third of its bulk, and exhibited under the microscope an abundance of mucous corpuscles and hyaline casts, together with a few cloudy epithelial casts. She died on November 6.

At the post-mortem examination fluid was found in both pleural cavities. The right pleural surfaces were covered with lymph, which was beginning to form adhesions. There was also a patch of rough lymph about the middle of the posterior surface of the left lung, which corresponded with the seat of a large patch of pulmonary apoplexy. In the upper and lower lobes of both lungs, there were numerous patches of pulmonary apoplexy of recent origin. Both lungs were very voluminous and generally emphysematous, but neither presented any distinct bullæ. The bronchial tubes were much injected and contained bloody mucus.

The serous surfaces of the pericardium and heart were normal. The heart was much enlarged, weighing nearly 20 ounces, but was nevertheless overlapped and almost concealed by the still more enlarged lungs. The position of the heart was transverse, its apex being tilted upwards. The right cavities were very largely dilated. The tricuspid and mitral valves were slightly thickened ; the pulmonary and aortic valves were normal and competent. The walls of both ventricles were much thickened. The liver was enlarged, and presented the so-called nutmeg appearance.



The kidneys were of moderate size, their capsules adherent; their surfaces red, very granular, and studded here and there with small cysts. On section the cortical parts were found to be somewhat wasted.

Although I have read this case on account of the hypertrophy and dilatation of the right side of the heart, consequent upon the bronchitis and emphysema, the history discloses other serious lesions of important organs, which cannot be passed over without notice.

The case was, in fact, a very complicated one. Not only was there considerable hypertrophy of the right ventricle with large dilatation of the right auricle and ventricle, but the left ventricle was also much hypertrophied. The liver was much diseased; the kidneys were granular; and, lastly, judging from the well-marked rigidity of the radial arteries, the arterial system must have been generally diseased and inelastic.

It is, I consider, quite impossible that all these morbid changes should have taken place during the short period assigned by the patient as the duration of her illness. She stated that she had been in good health until her first attack of bronchitis, only eight months before her admission; but the disease in the arteries and kidneys had certainly been of considerably longer standing. Whether the arterial or the renal disease had been the primary one does not now concern us. The original cause of both diseases I believe to have been the woman's confirmed intemperance, and their existence fully accounts for the hypertrophy of the left ventricle. They had, however, crept on so insidiously that the patient was entirely unaware that she was falling into ill-health until she began to suffer from bronchitis.

In this respect, indeed, the case is by no means an uncommon one; for bronchitis, when it attacks persons who have hitherto appeared in good health, often seems to be the

primary disease until some other disease which has been coming on imperceptibly, perhaps for months or even years, is brought to light by the aggravation of its symptoms induced by the pulmonary obstruction.

As regards the origin of the pulmonary disease in this patient, the nutrition of the lungs had doubtless been impaired both by her intemperate habits and also by the renal and arterial diseases to which these had given rise. Hence would proceed, not only a predisposition to bronchitis, but, also, such a loss of elasticity in the walls of the air-cells as would incapacitate them for resisting the strain brought to bear upon them in coughing. And thus, in the end, a common cold, contracted only a few months before death, developed at once into severe chronic bronchitis, which, in its turn, produced with great rapidity extensive emphysema and large dilatation of the right cavities of the heart.

But, although this case was thus a much more complicated one than that upon which I commented previously, the relation between the bronchitis and the hypertrophy and dilatation of the right side of the heart is identical in the two cases. The same observation applies to a very interesting case that was, several years ago, alternately under the care of Dr. Thompson and myself, and in which there was enormous dilatation of the right cavities of the heart. The case is, in that and other respects, of so remarkable a character that I shall make no apology for reading it to you.

CASE 74.—Joseph H., aged twenty-six years, a blacksmith by occupation, was admitted an out-patient, under my care, on March 20, 1863. His father had died of heart-disease and dropsy, but there was no history of phthisis in the family. The patient had never suffered from rheumatism, but he had for some years been subject to palpitation of the heart, which had come on so gradually that he could not fix any precise date for its commencement. He had also, for several

years, suffered more or less from cough in winter and spring; and about a year previous to his admission, he had had an attack of hæmoptysis, since the occurrence of which he had steadily declined in health.

At the time of admission he had much cough and expectoration. His complexion was very pallid; his skin was hot; voice raucous; pulse, 90. A loud systolic murmur was heard below the left nipple and also in the axillary region. There was dulness on percussion over both infra-clavicular regions, especially the left. Cavernous respiration with gurgling was heard in the apex of the left lung, coarse crepitation in that of the right lung. He was ordered to take a draught containing nitro-hydrochloric acid, wine of ipecacuanha and tincture of henbane three times a day, together with a tea-spoonful of cod-liver oil.

On April 4 the cough was much relieved, and the patient felt better, but the pallid complexion and the physical signs remained as before. A draught containing 20 minims each of the tinctures of digitalis and perchloride of iron was now substituted for his former medicine, and he was desired to take two tea-spoonfuls of cod-liver oil with each dose.

On May 3 he reported himself as much better, and as having gained strength enough to return to his work. His weight was 124 pounds. He was ordered to continue the cod-liver oil, with a drachm of syrup of iodide of iron, three times a day.

Under this treatment he decidedly improved; his weight increased up to 130 pounds; the cough and expectoration greatly diminished; and he was able to continue at work for several months.

On October 30 he presented himself, after a longer interval than usual, suffering from bronchitis throughout both lungs. The bronchitic sounds were so loud as to mask both

the mitral murmur and the phthisical signs. The lips were purple, and the whole face had a livid hue. Anasarca supervened in the course of a few days, the integuments of the thorax became œdematous, and, being unable to continue his attendance as an out-patient, he was admitted into the hospital on November 10, under the care of Dr. Thompson.

At that time his pulse was 120, small and weak; the respirations were 40 in the minute, and very irregular. His face and lips were livid and much swollen. The percussion-note was full and clear over the right side of the chest in front, short and ringing over the left side. The area of præcordial dulness was much extended in every direction. No valvular murmur was heard. Under the left clavicle there was bronchial breathing, accompanied by moist sounds of a sharp and almost metallic character. Over the remainder of the chest rhonchus and sibilus were everywhere audible.

On November 14 his face was dusky, and he had frequent loose cough, attended by a frothy, muco-purulent expectoration. His pulse was 112, weak; the respirations were 52, chiefly diaphragmatic.

On the 19th the œdema had increased. A loud systolic murmur was again heard two inches below the nipple and one inch to the left of the sternum. The external jugular veins were turgescient and beaded.

From this time he sank rapidly, and died on November 28.

At the post-mortem examination the body was found to be generally well nourished, but very œdematous. The face was livid and bloated. The lungs were both very voluminous and firmly attached to the ribs by old adhesions; they were emphysematous in front, but their posterior parts were congested.

In the apex of the right lung there were three cavities, the largest about the size of a walnut. Of these cavities, two

were empty, with smooth inner surfaces, having the appearance of being lined with a delicate membrane; the third cavity was filled with a semi-solid cheesy substance. In the apex of the left lung, close to its anterior surface, there was a cavity exactly resembling the empty ones in the right lung, but of rather larger size. None of these cavities communicated with any of the bronchial tubes. The bronchial tubes throughout both lungs were uniformly dilated.

Microscopical examination showed that the cavities were not lined with epithelium, but that the walls were formed of fibrous and elastic tissue, which could not be distinguished from the surrounding condensed pulmonary tissue.

The heart was of very large size; the right cavities being enormously dilated, and the left cavities considerably so. The tricuspid orifice would admit four fingers with ease. The wall of the right ventricle was three lines in thickness at the base. The tricuspid and pulmonary valves were normal. The mitral valve was somewhat thickened at the margin, and had a row of minute vegetations on the auricular surface; the orifice was of normal size. The wall of the left ventricle was six lines in thickness at the base.

The liver was rather small and presented a slightly nutmeg appearance. The kidneys were somewhat large and congested.

This case, therefore, as you have heard, was also a very complicated one. The man had long been subject to palpitation and to winter cough. When he first came under my observation in March he was manifestly suffering from incompetency of the mitral valve and from active phthisical disease in both lungs. At that time there was no evidence of the existence of any considerable degree of emphysema, which, however, became developed afterwards with great rapidity; for, on my re-examining him eight months afterwards, the dulness on percussion below the right clavicle

observed at his first examination had given place to abnormally clear resonance.

Meanwhile the phthisical symptoms had gradually abated, and the patient had gained flesh to such an extent that Dr. Cayley, in his notes of the post-mortem examination, reports the body to have been well nourished.

On the first approach of cold weather, however, he had again been attacked by bronchitis, which now, in conjunction with the emphysema, had so impeded the flow of blood through the lungs, and consequently through the right side of the heart, as to produce large dilatation of its cavities, and give rise to the venous congestion, which was manifested, during life, by the lividity of countenance, and by the anasarca and œdema.

Lastly, I must not pass over without notice a point of very striking interest in the case, although it does not fall exactly within the scope of the present lecture. Several eminent authorities, amongst them Rokitansky, have supposed that the venous condition of the blood which exists in emphysema is antagonistic to the development of phthisis. Whether any relation of cause and effect existed, in this case, between the development of the emphysema and the arrest of the previously active phthisical disease, I am not prepared to decide; but the post-mortem examination certainly revealed one of the most remarkable examples of almost cured phthisis which has ever fallen under my observation.

Of the several cases which I have read to you to-day, the first only exemplifies the relation between bronchitis and disease of the right side of the heart in its simple form. The other cases belong to the much more numerous class of cases in which the pulmonary and cardiac lesions are complicated with other serious diseases which have preceded, and at least contributed to cause, the bronchitis.

You must bear in mind, however, in conclusion, that it is

a matter of no moment, with respect to the causation of disease of the heart by bronchitis and emphysema, whether the bronchitis be primary or secondary; or, if secondary, from what cause it may have originated. Provided that it produce sufficient obstruction to the flow of blood through the lungs, it must tend to cause hypertrophy and dilatation of the right side of the heart.

# I N D E X.

	PAGE
Abstraction of blood in pulmonary congestion . . . . .	78
Acute bronchitis, treatment of . . . . .	50
"  catarrh, prophylactic treatment of . . . . .	53
"  "  modes of checking . . . . .	51, 52
"  emphysema . . . . .	17, 67, 93
Adams, Dr., safety-valve function of tricuspid valve . . . . .	249
Administration of stimulants, rules for . . . . .	80
Air-vesicles, loss of elasticity in walls of, . . . . .	245
Albuminuria a predisposing cause of bronchitis . . . . .	29
"  a consequence of venous congestion . . . . .	287
"  and bronchitis . . . . .	44, 283
"  a secondary consequence of emphysema . . . . .	247, 248
"  cause of in pulmonary emphysema . . . . .	248
"  in connection with gout and bronchitis . . . . .	132
Alternations of bronchitis and eczema . . . . .	157
"  "  "  "  gout . . . . .	133, 134, 135, 138, 139, 141
"  "  bronchitis, gout, and psoriasis . . . . .	133, 151
"  "  gout, bronchitis, and lepra . . . . .	137
Ammoniacum to check copious expectoration . . . . .	228
Amyl, inhalation of nitrite of, in dyspnœa . . . . .	99
"  internal use of nitrite of . . . . .	101, 265
Anæmic appearance of lungs in emphysema . . . . .	248
Anasarca a secondary consequence of emphysema . . . . .	247, 248
"  a result of venous congestion . . . . .	317
"  cause of in pulmonary emphysema . . . . .	248
"  in bronchitis . . . . .	42, 247, 283
Antimony, wine of, in bronchitis . . . . .	78, 92
Appearances; post-mortem, in chaff-cutters' bronchitis . . . . .	119
Articulation, interrupted . . . . .	67
Asphyxia from imperfect aëration of blood . . . . .	56
Asthmatic attacks in bronchitis . . . . .	265
"  dyspnœa, Dr. Graves on . . . . .	130
"  "  paroxysms of . . . . .	67



	PAGE
Asthmatic paroxysms, cause of . . . . .	67, 68
"      "      in dry catarrh . . . . .	98
"      "      "  emphysema . . . . .	252
Atrophy of air-cell walls a cause of pulmonary emphysema . . . . .	236
"      "      bronchial tubes in bronchiectasis . . . . .	225
Beef-tea, cold concentrated, formula for making . . . . .	48
Benzoin, compound tincture of, in bronchitis . . . . .	228
Blood, abstraction of, in pulmonary congestion . . . . .	78
"      imperfect aëration of . . . . .	70
Bronchial tubes, plugging of . . . . .	71
Bronchiectasis and gangrene of lungs . . . . .	224
"      complicated with phthisis . . . . .	213
"      degeneration of bronchial tubes a cause of . . . . .	200
"      deranged mechanism of respiration a cause of . . . . .	199, 206, 225, 226
"      diagnosis of, from phthisis . . . . .	195, 196, 204, 216
"      fetid sputum in . . . . .	201, 211, 219, 224
"      impaired nutrition of bronchial tubes in . . . . .	225
"      in cirrhotic lungs . . . . .	226
"      mode of origin of . . . . .	198
"      post-mortem appearances in . . . . .	198, 220, 224
"      commonly situated near the periphery of lungs . . . . .	200
Bronchitis a cause of degeneration of lung tissue . . . . .	260
"      "      "  disease of the lungs, heart, and kidneys . . . . .	2
"      "      "  emphysema . . . . .	237
"      "      "  impeded flow of blood through the lungs . . . . .	57
"      "      "  consequence of disease of lungs, heart, and kidneys . . . . .	2
"      acute, treatment of . . . . .	50, 51
"      and acute renal dropsy . . . . .	41
"      "      albuminuria . . . . .	44
"      cause of dyspnœa in . . . . .	53
"      danger of, varies with seat of irritation . . . . .	32
"      from exposure to cold . . . . .	106
"      and lithuria . . . . .	161
"      and rheumatic fever . . . . .	277
"      a secondary disease . . . . .	128
"      association of, with psoriasis . . . . .	147
"      constitutional symptoms of . . . . .	3
"      from mechanical irritation, course of . . . . .	110, 117
"      from the inhalation of dust . . . . .	108
"      "      "      of irritating vapours . . . . .	124
"      gout, and chronic renal disease . . . . .	154
"      gouty dyscrasia a cause of . . . . .	129
"      gout, psoriasis, and albuminuria . . . . .	150
"      in chaff-cutters . . . . .	119
"      in grinders . . . . .	112



	PAGE
Cough, character of, in bronchitis . . . . .	7
Course of phthisis following catarrhal pneumonia . . . . .	173, 176
"    "    "    "    interstitial    "    . . . . .	171
Cracked-pot sound in bronchitis . . . . .	19
Creosote inhalations to check copious expectoration . . . . .	228
Crepitation, causes of . . . . .	22
"    characters of . . . . .	22
"    varieties of . . . . .	22, 23
Cullen, Dr., definition of phthisis . . . . .	165
"    "    on abstraction of blood in congestion of lungs . . . . .	78
Degeneration of lung tissue a cause of pulmonary emphysema . . . . .	234
Delirium in capillary bronchitis, cause of . . . . .	67
Diagnosis of catarrhal phthisis . . . . .	192
Diaphragm, downward displacement of, in emphysema . . . . .	255
"    perverted action of, when displaced in emphysema . . . . .	271
Dilatation of bronchial tubes . . . . .	199, 200
Dilatations in bronchiectasis, different forms of . . . . .	197, 203
Dilatation of vesicular portion of lungs . . . . .	229
"    "    right cavities of heart . . . . .	302, 304, 311
"    "    "    ventricle . . . . .	307
Diseases, certain, as causes of bronchitis . . . . .	29
Disease of right side of heart, causes of . . . . .	303, 304
Displacement of heart in pulmonary emphysema . . . . .	107
Dyspnœa, asthmatic causes of . . . . .	67, 252
"    cause of, in bronchitis . . . . .	45, 53
"    in capillary bronchitis . . . . .	67
Dropsy, acute renal, and bronchitis . . . . .	41
Dry catarrh, asthmatic paroxysms in . . . . .	98
"    "    course of . . . . .	82
"    "    emetics in dyspnœa of . . . . .	101
"    "    relations of, with several constitutional conditions . . . . .	82
Dry over-heated air an exciting cause of bronchitis . . . . .	30
Dust, inhalation of " " " " " . . . . .	30
Elastic lung tissue in expectoration . . . . .	214
Emetics in the dyspnœa of dry catarrh . . . . .	101
Emphysema, a complementary lesion . . . . .	232, 237
"    acute . . . . .	17, 67, 93, 260
"    a hereditary disease . . . . .	235
"    altered mechanism of respiration in . . . . .	267, 270, 273, 274, 278
"    and bronchitis, causes of diseases of right side of heart . . . . .	304
"    cause of anæmic lungs in . . . . .	248
"    diagnosis of . . . . .	242
"    difficulty of expiration in . . . . .	278
"    displacement of heart in . . . . .	256, 270, 273, 275
"    effects of, on action of heart . . . . .	248

	PAGE
Emphysema, expiratory theory of production . . . . .	233
" frequently caused by dry catarrh . . . . .	81
" Dr. Gairdner's theory of production . . . . .	232
" globular form of thorax in . . . . .	277
" gout a predisposing cause of . . . . .	245, 246
" hypertrophy and dilatation of right side of heart in . . . . .	248
" inspiratory theory of production . . . . .	231
" Laennec's explanation of cause of . . . . .	231
" Louis's objections to expiratory theory of . . . . .	231
" nature of . . . . .	230
" physical signs of . . . . .	230, 242
" relations with bronchitis . . . . .	229
" senile . . . . .	236
" substantive, a constitutional affection . . . . .	237
" symptoms of . . . . .	238, 242
Ether, inhalation of, in asthmatic dyspnoea . . . . .	99
" " " " orthopnoea . . . . .	265
Exciting causes of bronchitis . . . . .	25
" " " direct . . . . .	30
" " " indirect . . . . .	30
Expansion, defective, of thorax in emphysema . . . . .	278
Expectoration, character of, in bronchitis . . . . .	7
" " " " dry catarrh . . . . .	82, 85, 87
" concocted, characters of . . . . .	10, 37
" crude, " " . . . . .	8, 37
" Dr. Stokes upon, in bronchitis . . . . .	8
" in acute bronchitis . . . . .	8
" in chronic " . . . . .	9
" lung tissue in . . . . .	113
" muco-purulent . . . . .	10
" of casts of bronchial tubes . . . . .	11
" putrid . . . . .	12, 210, 219, 224
" serous . . . . .	12
" stained with soot . . . . .	15, 40
Expiration incomplete in emphysema . . . . .	278
Expiratory theory of the mechanism of pulmonary emphysema . . . . .	232, 234
Fever in bronchitis, character of . . . . .	4, 36
Flue of cotton, feathers, and wool, exciting causes of . . . . .	30
Fog, London, a cause of bronchial irritation . . . . .	40, 76, 95
Fumes from combustion of coke and charcoal a cause of bronchitis . . . . .	124
Gairdner's, Dr., theory of the mode of production of pulmonary emphysema . . . . .	231, 232
Gangrene of lungs in bronchiectasis . . . . .	224

	PAGE
Garrod, Dr., on relations between gout, eczema, and psoriasis . . . . .	148
Gastric catarrh, a complication of acute bronchitis . . . . .	4, 263
Gout, bronchitis, and chronic renal disease . . . . .	154
"  a predisposing cause of emphysema . . . . .	245, 246
Gouty constitution, its relation to bronchitis . . . . .	29, 128
"  diathesis a predisposing cause of pulmonary emphysema . . . . .	245
Gravel alternating with bronchitis . . . . .	162
Graves, Dr., on asthmatic dyspnoea . . . . .	130
Grinders, bronchitis in . . . . .	16, 112
Hæmoptysis affording relief in bronchial congestion . . . . .	186, 287
"  in bronchiectasis . . . . .	210
"  "  bronchitis . . . . .	14
"  "  dry catarrh . . . . .	91, 102
"  "  emphysema . . . . .	15, 239, 267, 269
"  "  plastic bronchitis . . . . .	11
Head-ache in dry catarrh . . . . .	92, 265
Heart, displacement of, in emphysema . . . . .	256, 273, 275
"  hypertrophy and dilatation of right ventricle caused by emphysema . . . . .	280
"  incompetency of mitral valves of, a predisposing cause of bronchitis . . . . .	280
"  incompetency of tricuspid valves caused by emphysema . . . . .	248, 280, 286
Hereditary tendency, a predisposing cause of bronchitis . . . . .	27
Holland, Sir Henry, relations between gout and psoriasis . . . . .	133
Hunter, John, on tricuspid valve . . . . .	249
Hypertrophy and dilatation of right side of heart caused by bron- chitis and emphysema . . . . .	281, 306, 312, 316
"  of heart in bronchitis, cause of . . . . .	70
"  of right ventricle, a result of emphysema . . . . .	248
Hypostatic congestion of lungs a cause of bronchitis in fevers . . . . .	31, 49
Incompetency of tricuspid valves . . . . .	306
Influenza or epidemic catarrh . . . . .	4, 5
Inhalation of creosote . . . . .	228
"  "  dust a cause of bronchial irritation . . . . .	252
"  "  ether . . . . .	68
"  "  "  in orthopnoea . . . . .	265
"  "  nitrite of amyl in dyspnoea . . . . .	99
"  "  oil of pinus sylvestris in bronchitis . . . . .	185
"  "  "  "  turpentine "  " . . . . .	212
Ipecacuanha, wine of, in bronchitis . . . . .	79
Irritating vapours exciting causes of bronchitis . . . . .	30
Inspiratory theory of the mechanism of emphysema . . . . .	231, 232
Interstitial pneumonia a sequel of bronchitis . . . . .	165



	PAGE
Phthisis a sequel of catarrhal pneumonia . . . . .	173, 176
"    "    "    interstitial    "    . . . . .	165
"    catarrhal, prognosis in . . . . .	192
Physical signs of bronchitis . . . . .	17
Pleuritic adhesions an indirect cause of bronchiectasis . . . . .	226
Pneumonia, catarrhal, a sequel of bronchitis . . . . .	173
"    interstitial, a cause of phthisis . . . . .	165
"    "    a sequel of bronchitis . . . . .	165
Post-mortem appearances in chaff-cutters' lungs . . . . .	119
Potters' asthma . . . . .	16
Predisposing causes of bronchitis . . . . .	25
Prognosis in catarrhal phthisis . . . . .	192
Psoriasis, association of, with bronchitis . . . . .	147
Pulmonary emphysema. ( <i>See Emphysema.</i> )	
"    "    divided respiration in . . . . .	159
"    "    a predisposing cause of bronchitis . . . . .	29
"    tuberculosis secondary to bronchiectasis . . . . .	222
Pulsation in veins . . . . .	69, 285
"    "    cervical veins . . . . .	285
Pulse, frequent in capillary bronchitis . . . . .	60, 62
Pulse in acute bronchitis . . . . .	4
Putrid expectoration . . . . .	12
Quinine for checking acute bronchitis . . . . .	51
Rainey, Mr., on fatty degeneration of walls of air-vesicles in emphysema . . . . .	235
Rapid breathing in capillary bronchitis, cause of . . . . .	60, 62
Regurgitation, tricuspid, a result of emphysema . . . . .	49
Relapses, frequent in dry catarrh . . . . .	94
Renal disease, gout and bronchitis . . . . .	154
Resonance, percussion in bronchitis . . . . .	18
Respiration, deranged mechanism of, a cause of bronchiectasis . . . . .	225
"    frequency of, in capillary bronchitis . . . . .	56, 60, 62
"    divided, in pulmonary emphysema . . . . .	159
"    laborious, in capillary bronchitis . . . . .	56
Respiratory movements in bronchitis . . . . .	17
Rheumatic fever and bronchitis . . . . .	277
Rhonchus, cause of . . . . .	21
"    characters of . . . . .	21
Right ventricle, hypertrophy of . . . . .	69, 70
Senega draught of the Middlesex Hospital . . . . .	64
Serous expectoration . . . . .	12
Shrinking of consolidated lung tissue a cause of bronchiectasis . . . . .	227
Sibilus, cause of . . . . .	19
"    characters of . . . . .	20, 21

	PAGE
Siliceous particles found in lungs . . . . .	170
Simple acute bronchitis . . . . .	32, 33
"    "    "    diagnosis of . . . . .	37
Skin, chilling of, an indirect exciting cause of bronchitis . . . . .	30
Soot absorbed into tissues of lungs . . . . .	16
Soot in expectoration . . . . .	15, 40
Sputum. ( <i>See</i> Expectoration.)	
Squills, tincture of, in bronchitis . . . . .	79
Stimulants, use of, in capillary bronchitis . . . . .	79
Stokes, Dr., on cracked-pot sound in bronchitis . . . . .	19
"    "    "    displacement of diaphragm in pulmonary emphysema	255
"    "    "    expectoration in bronchitis . . . . .	8
Stone-masons, bronchitis in . . . . .	109
Stramonium cigarettes in asthmatic dyspnoea . . . . .	101, 254
Substantive or constitutional emphysema . . . . .	237
Temperature in bronchitis . . . . .	4
"    "    chronic bronchitis . . . . .	211
Thorax, globular form of, in emphysema . . . . .	277
"    movements of, in bronchitis . . . . .	17
Todd, Dr., on gouty kidneys . . . . .	153
"    "    "    malt liquors as a cause of gout . . . . .	141
Tool-makers, bronchitis in . . . . .	114
Tricuspid regurgitation a result of pulmonary emphysema . . . . .	249
"    "    in bronchitis . . . . .	281, 286
"    incompetency . . . . .	306
"    valve, safety-valve function of . . . . .	249
Tubes, bronchial plugging of . . . . .	71
Turpentine oil, inhalation of, in bronchitis . . . . .	212
Typhoid fever, bronchitis in . . . . .	31, 46
Ulceration in bronchiectic cavities . . . . .	224
Urate of soda, deposit of, in kidneys . . . . .	153, 157
Urine, characters of, in acute bronchitis . . . . .	4
Veins, pulsation in . . . . .	60
Venous congestion a consequence of emphysema . . . . .	247
"    "    in capillary bronchitis . . . . .	57
"    "    symptoms of . . . . .	70
Waters, Dr., constitutional nature of pulmonary emphysema . . . . .	234
Watson, Sir Thomas, on causes of lepra and psoriasis . . . . .	148
Zenker, on lungs coloured by oxide of iron . . . . .	16



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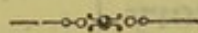
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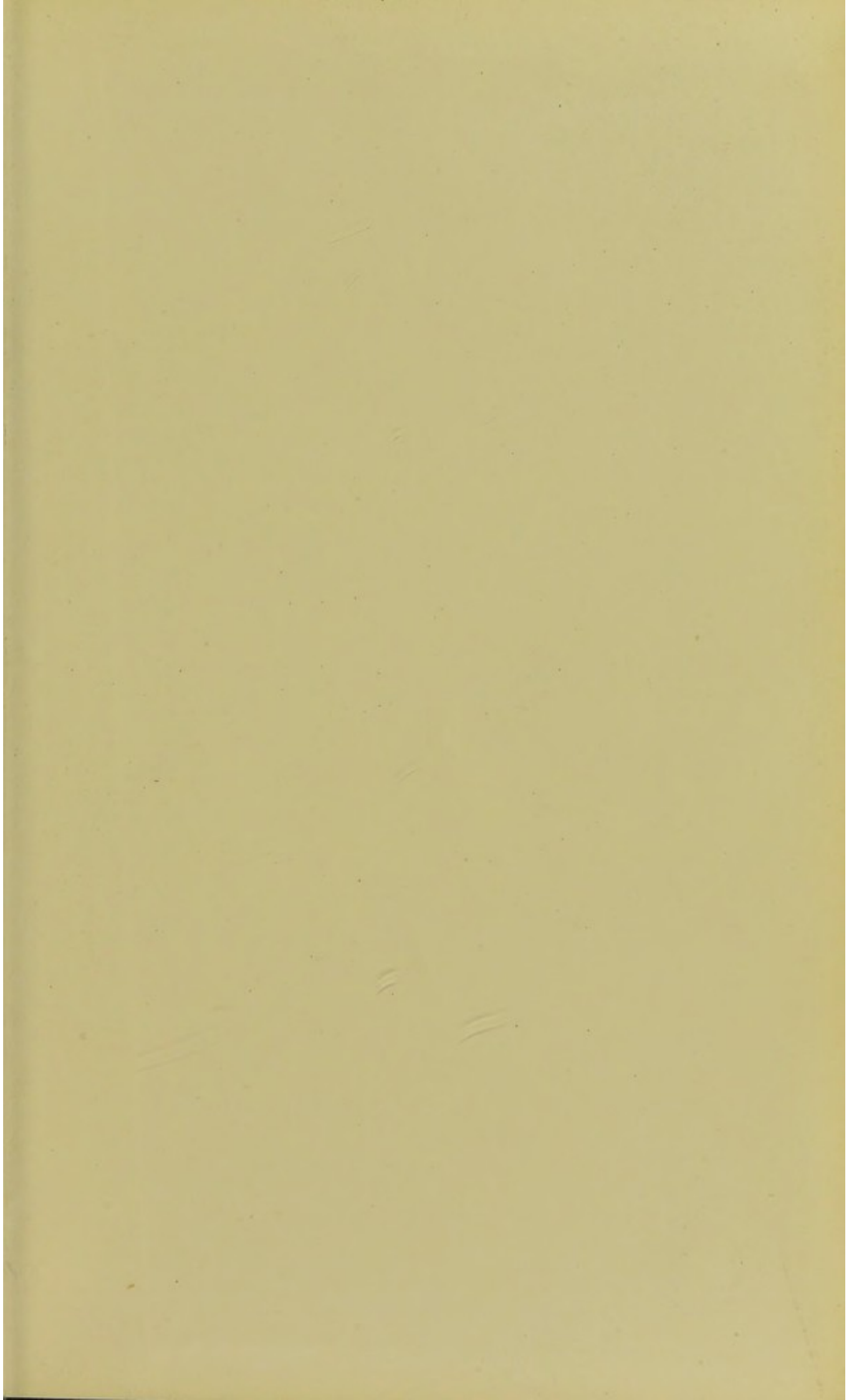
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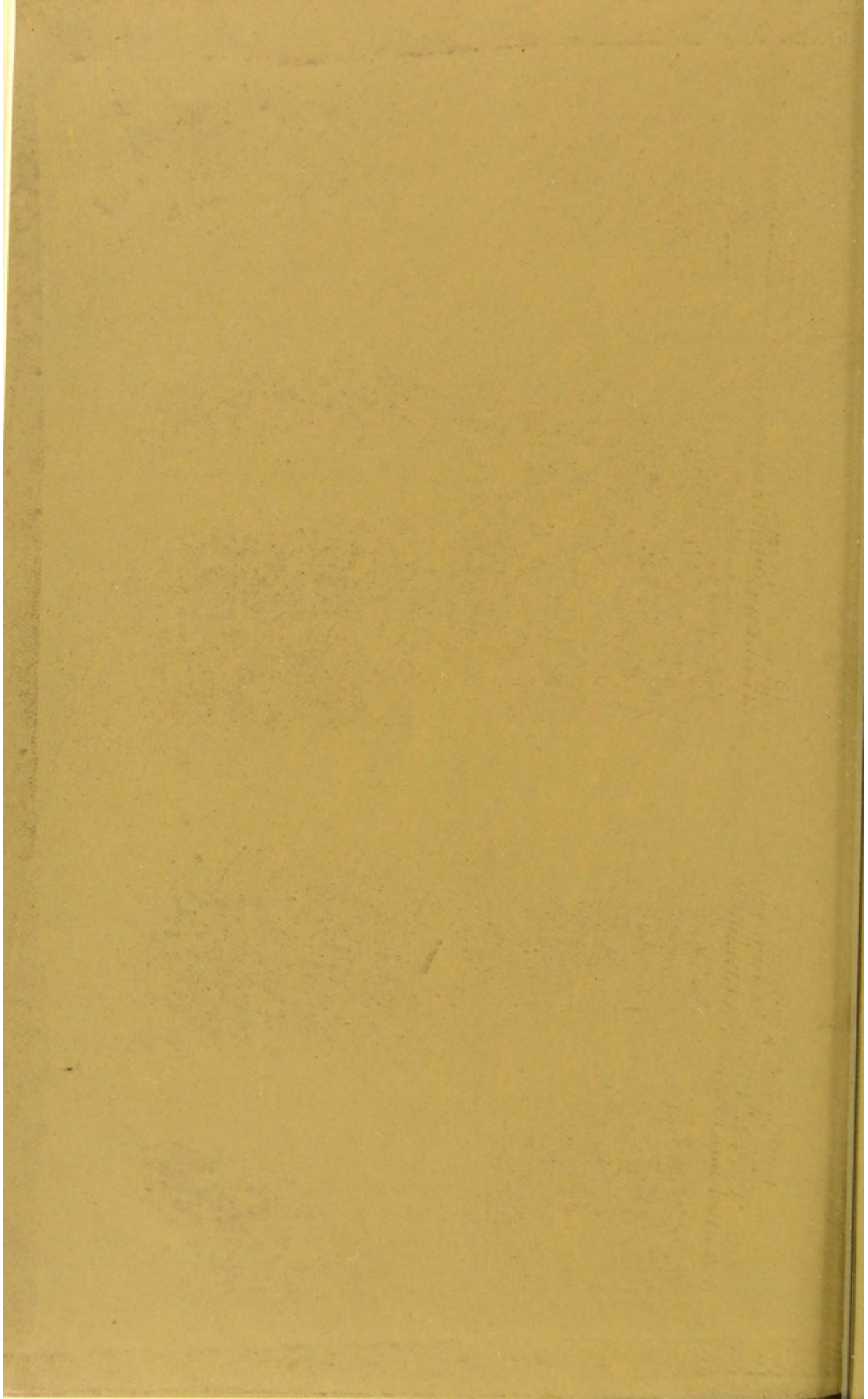
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— Early Roman Empire . . . . .	3	<i>Froude's</i> English in Ireland . . . . .	1
<i>Carpenter</i> on Mesmerism, Spiritualism, &c. . . . .	6	— History of England . . . . .	1
<i>Cates's</i> Biographical Dictionary . . . . .	4	— Short Studies . . . . .	6
<i>Cayley's</i> Iliad of Homer . . . . .	19	<i>Gairdner's</i> Houses of Lancaster and York . . . . .	3
Changed Aspects of Unchanged Truths . . . . .	7	— Richard III. & Perkin Warbeck . . . . .	3
<i>Chesney's</i> Indian Polity . . . . .	2	<i>Ganot's</i> Elementary Physics . . . . .	10
<i>Chesney's</i> Waterloo Campaign . . . . .	2	— Natural Philosophy . . . . .	10
<i>Church's</i> Beginning of the Middle Ages . . . . .	3	<i>Gardiner's</i> Buckingham and Charles . . . . .	2
<i>Colenso</i> on Moabite Stone &c. . . . .	17	— Personal Government of Charles I. . . . .	2
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Commonplace Philosopher in Town and Country . . . . .	7	— Thirty Years' War . . . . .	3
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<i>Congreve's</i> Politics of Aristotle . . . . .	6	German Home Life . . . . .	7
<i>Conington's</i> Translation of Virgil's <i>Æneid</i> . . . . .	19	<i>Goldziher's</i> Hebrew Mythology . . . . .	16
— Miscellaneous Writings . . . . .	6	<i>Goodeve's</i> Mechanics . . . . .	11
<i>Contanseau's</i> Two French Dictionaries . . . . .	8	— Mechanism . . . . .	11
<i>Conybeare</i> and <i>Howson's</i> Life and Epistles of St. Paul . . . . .	15	<i>Gore's</i> Art of Scientific Discovery . . . . .	13
<i>Cordery's</i> Struggle against Absolute Monarchy . . . . .	3	— Electro-Metallurgy . . . . .	11
<i>Cotta</i> on Rocks, by <i>Lawrence</i> . . . . .	12	<i>Grant's</i> Ethics of Aristotle . . . . .	6
Counsel and Comfort from a City Pulpit . . . . .	7	Graver Thoughts of a Country Parson . . . . .	7
<i>Cox's</i> (G. W.) Athenian Empire . . . . .	3	<i>Greville's</i> Journal . . . . .	1
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— Greeks and Persians . . . . .	3	<i>Grove</i> (Sir W. R.) on Correlation of Physical Forces . . . . .	10
<i>Creighton's</i> Age of Elizabeth . . . . .	3	<i>Gwill's</i> Encyclopædia of Architecture . . . . .	14
— England a Continental Power . . . . .	3	<i>Hale's</i> Fall of the Stuarts . . . . .	3
— Tudors and the Reformation . . . . .	3	Handbook on Gold and Silver . . . . .	21
<i>Cresy's</i> Encyclopædia of Civil Engineering . . . . .	14	<i>Hartley</i> on the Air . . . . .	9
Critical Essays of a Country Parson . . . . .	7	<i>Hartwig's</i> Aerial World . . . . .	11
<i>Crookes's</i> Anthracen . . . . .	14	— Polar World . . . . .	11
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<i>Crump's</i> Manual of Banking . . . . .	21	— Tropical World . . . . .	11
<i>Culley's</i> Handbook of Telegraphy . . . . .	14	<i>Haughton's</i> Animal Mechanics . . . . .	10
<i>Curteis's</i> Macedonian Empire . . . . .	3	<i>Heer's</i> Primeval World of Switzerland . . . . .	12
<i>D'Aubignè's</i> Reformation . . . . .	16	<i>Heine's</i> Life and Works, by <i>Stigand</i> . . . . .	4
<i>De Caisne</i> and <i>Le Maout's</i> Botany . . . . .	12	<i>Helmholtz</i> on Tone . . . . .	10
<i>De Tocqueville's</i> Democracy in America . . . . .	5	<i>Helmholtz's</i> Scientific Lectures . . . . .	10
<i>Digby's</i> Indian Famine Campaign . . . . .	2	<i>Hemsley's</i> Trees and Shrubs . . . . .	12
<i>Dobson</i> on the Ox . . . . .	20	<i>Herschel's</i> Outlines of Astronomy . . . . .	9
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<i>Dowell's</i> History of Taxes . . . . .	5	<i>Hobson's</i> Amateur Mechanic . . . . .	13
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<i>Eastlake's</i> Hints on Household Taste . . . . .	14	<i>Howorth's</i> Mongols . . . . .	2
<i>Edwards's</i> Nile . . . . .	17	<i>Hullah's</i> History of Modern Music . . . . .	12
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Epochs of Ancient History . . . . .	3	— History of Rome . . . . .	2
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— Modern History . . . . .	3	<i>Ingelow's</i> Poems . . . . .	19
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<i>Ewald's</i> History of Israel . . . . .	16	— Legends of the Monastic Orders . . . . .	13
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		<i>Johnston's</i> Geographical Dictionary . . . . .	8
		<i>Jonson's</i> (Ben) Every Man in his Humour . . . . .	6

<i>Jukes's</i> Types of Genesis .....	16	<i>Maunder's</i> Scientific and Literary Treasury .....	20
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<i>Kalisch's</i> Bible Studies .....	16	— Treasury of Natural History ...	20
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<i>Keith's</i> Evidence of Prophecy .....	15	<i>May's</i> History of Democracy .....	1
<i>Keller's</i> Lake Dwellings of Switzerland....	12	— History of England .....	1
<i>Kerl's</i> Metallurgy, by <i>Crookes</i> and <i>Röhrig</i> ..	14	<i>Melville's</i> Digby Grand .....	18
<i>Kingzett's</i> Alkali Trade .....	13	— General Bounce .....	18
— Animal Chemistry .....	12	— Gladiators .....	18
<i>Kirby and Spence's</i> Entomology .....	11	— Good for Nothing .....	18
<i>Knatchbull-Hugessen's</i> Fairy-Land .....	18	— Holmby House .....	18
— Higgledy-Piggledy .....	18	— Interpreter .....	18
<i>Kuenen's</i> Prophets and Prophecy in Israel	15	— Kate Coventry .....	18
Landscapes, Churches, &c.....	7	— Queen's Maries .....	18
<i>Latham's</i> English Dictionaries .....	7	Memorials of <i>Charlotte Williams-Wynn</i>	4
— Handbook of English Language	8	<i>Mendelssohn's</i> Letters .....	4
<i>Lecky's</i> History of England.....	1	<i>Merivale's</i> Fall of the Roman Republic ...	2
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— Rationalism .....	3	— Roman Triumvirates.....	3
— Leaders of Public Opinion.....	4	— Romans under the Empire .....	2
<i>Lefroy's</i> Bermudas .....	18	<i>Merrifield's</i> Arithmetic and Mensuration..	11
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<i>Lewes's</i> Biographical History of Philosophy	3	<i>Mill (J.)</i> on the Mind .....	5
<i>Lewis</i> on Authority .....	6	<i>Mill's (J. S.)</i> Autobiography .....	4
<i>Liddell and Scott's</i> Greek-English Lexicons	8	— Dissertations & Discussions	5
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<i>Lloyd's</i> Magnetism .....	10	— Hamilton's Philosophy .....	5
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— England .....	2	— Utilitarianism .....	5
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<i>Loudon's</i> Encyclopædia of Agriculture ...	15	— Inorganic Chemistry.....	11
— Gardening .....	15	<i>Mitchell's</i> Manual of Assaying .....	15
— Plants.....	12	<i>Milton's</i> Paradise Regained, by <i>Ferram</i> ...	6
<i>Lubbock's</i> Origin of Civilisation .....	12	Modern Novelist's Library .....	18
<i>Ludlow's</i> American War.....	3	<i>Monsell's</i> Spiritual Songs.....	16
<i>Lyra Germanica</i> .....	17	<i>Moore's</i> Irish Melodies, Illustrated Edition	13
<i>Macaulay's (Lord)</i> Clive, by <i>Bowen</i> .....	6	— Lalla Rookh, Illustrated Edition..	13
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— Lays of Ancient Rome	13	<i>Müller's</i> Chips from a German Workshop.	7
— Life and Letters.....	4	— Science of Language .....	7
— Miscellaneous Writings	7	— Science of Religion .....	3
— Speeches .....	7	<i>Mullinger's</i> Schools of Charles the Great ...	6
— Works .....	1	<i>Neison</i> on the Moon.....	9
— Writings, Selections from	7	<i>Nevile's</i> Horses and Riding .....	19
<i>McCulloch's</i> Dictionary of Commerce .....	8	<i>Newman's</i> Apologia pro Vitâ Suâ.....	4
<i>Macfarren</i> on Musical Harmony .....	13	<i>Nicol's</i> Puzzle of Life .....	12
<i>Macleod's</i> Economical Philosophy.....	5	<i>Northcott's</i> Lathes & Turning .....	14
— Economics for Beginners .....	21	<i>O'Conor's</i> Scripture Commentary .....	16
— Theory and Practice of Banking	21	One Hundred Holy Songs, &c.....	16
— Elements of Banking.....	21	<i>Owen's</i> Evenings with the Skeptics .....	6
Mademoiselle Mori .....	18	— (Prof.) Comparative Anatomy and	
<i>Maguire's</i> Pope Pius IX.....	4	— Physiology of Vertebrate Animals	11
<i>Malet's</i> Annals of the Road .....	19	<i>Pack's</i> Guide to the Pyrenees .....	17
<i>Manning's</i> Mission of the Holy Spirit .....	17	<i>Pattison's</i> Casaubon.....	4
<i>Marlowe's</i> Doctor Faustus, by <i>Wagner</i> ...	6	<i>Payen's</i> Industrial Chemistry.....	14
<i>Marshman's</i> Life of Havelock .....	4	<i>Pewtner's</i> Comprehensive Specifier .....	20
<i>Martineau's</i> Christian Life.....	17	<i>Pierce's</i> Chess Problems .....	20
— Hours of Thought.....	17	<i>Pole's</i> Game of Whist .....	20
— Hymns.....	16	<i>Pope's</i> Select Poems, by <i>Arnold</i> .....	6
<i>Maunder's</i> Biographical Treasury .....	20	<i>Powell's</i> Early England .....	3
— Geographical Treasury .....	20	<i>Preece &amp; Sivewright's</i> Telegraphy.....	11
— Historical Treasury .....	20	Present-Day Thoughts.....	7

<i>Proctor's</i> Astronomical Essays .....	9	<i>Taylor's</i> ( <i>Jeremy</i> ) Works, edited by <i>Eden</i> .....	16
Cycloid .....	9	Text-Books of Science.....	11
Moon.....	9	<i>Thom's</i> Botany .....	11
Orbs around Us .....	9	<i>Thomson's</i> Laws of Thought ..	6
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Saturn .....	9	<i>Thorpe and Muir's</i> Qualitative Analysis ...	11
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Transits of Venus .....	9	<i>Trench's</i> Realities of Irish Life .....	7
Two Star Atlases.....	9	<i>Trollope's</i> Barchester Towers.....	18
Universe of Stars .....	9	Warden .....	18
<i>Prothero's</i> De Montfort .....	2	<i>Twiss's</i> Law of Nations .....	5
Public Schools Atlas of Ancient Geography	8	<i>Tyndall's</i> American Lectures on Light ...	10
Atlas of Modern Geography .....	8	Diamagnetism.....	10
<i>Rawlinson's</i> Parthia.....	3	Fragments of Science.....	10
Sassanians .....	3	Heat a Mode of Motion .....	10
Recreations of a Country Parson .....	7	<i>Tyndall's</i> Lectures on Electricity .....	10
<i>Reynardson's</i> Down the Road .....	19	Lectures on Light .....	10
<i>Rich's</i> Dictionary of Antiquities .....	8	Lectures on Sound.....	10
<i>Rivers's</i> Rose Amateur's Guide.....	12	Lessons in Electricity .....	10
<i>Rogers's</i> Eclipse of Faith.....	15	Molecular Physics.....	10
Defence of Eclipse of Faith .....	15	Unawares .....	18
<i>Rogel's</i> Thesaurus of English Words and		<i>Unwin's</i> Machine Design .....	11
Phrases .....	8	<i>Ure's</i> Dictionary of Arts, Manufactures,	
<i>Ronald's</i> Fly-Fisher's Entomology .....	12	and Mines .....	14
<i>Rothschild's</i> Israelites .....	15	<i>Vaughan's</i> Trident, Crescent, and Cross...	16
<i>Rowley's</i> Rise of the People .....	3	<i>Walker</i> on Whist.....	20
Settlement of the Constitution ...	3	<i>Walpole's</i> History of England .....	1
<i>Sanders's</i> Justinian's Institutes .....	5	<i>Warburton's</i> Edward the Third .....	3
<i>Sankey's</i> Sparta and Thebes .....	3	<i>Watson's</i> Geometery .....	11
<i>Schellen's</i> Spectrum Analysis.....	9	<i>Watts's</i> Dictionary of Chemistry .....	13
Seaside Musing.....	7	<i>Webb's</i> Objects for Common Telescopes ...	9
<i>Seebohm's</i> Oxford Reformers of 1498.....	2	<i>Weinhold's</i> Experimental Physics .....	10
Protestant Revolution .....	3	<i>Wellington's</i> Life, by <i>Gleig</i> .....	4
<i>Sewell's</i> History of France .....	2	<i>Whately's</i> English Synonymes .....	8
Passing Thoughts on Religion ...	16	Logic .....	6
Preparation for Communion .....	16	Rhetoric .....	6
Stories and Tales .....	18	<i>White's</i> Four Gospels in Greek.....	16
Thoughts for the Age .....	16	and <i>Riddle's</i> Latin Dictionaries ...	8
<i>Shelley's</i> Workshop Appliances .....	11	<i>Wilcocks's</i> Sea-Fisherman .....	19
<i>Shipley's</i> Ritual of the Altar .....	16	<i>Williams's</i> Aristotle's Ethics.....	5
<i>Short's</i> Church History .....	3	<i>Willich's</i> Popular Tables .....	21
<i>Smith's</i> ( <i>Sydney</i> ) Essays .....	7	<i>Wilson's</i> Resources of Modern Countries...	21
Wit and Wisdom .....	7	<i>Wood's</i> ( <i>J. G.</i> ) Bible Animals .....	11
(Dr. R. A.) Air and Rain .....	9	Homes without Hands ...	11
(R. B.) Carthage & the Carthaginians	2	Insects at Home .....	11
<i>Southey's</i> Poetical Works.....	19	Insects Abroad.....	11
<i>Stanley's</i> History of British Birds .....	11	Out of Doors .....	11
<i>Stephen's</i> Ecclesiastical Biography.....	4	Strange Dwellings .....	11
<i>Stonehenge</i> on the Dog.....	19	(J. T.) Ephesus .....	17
on the Greyhound .....	19	<i>Woodward's</i> Geology .....	12
<i>Stoney</i> on Strains .....	14	<i>Yonge's</i> English-Greek Lexicons .....	8
<i>Stubbs's</i> Early Plantagenets .....	3	Horace.....	19
Sunday Afternoons, by A. K. H.B. ....	7	<i>Youatt</i> on the Dog .....	19
Supernatural Religion .....	16	on the Horse .....	19
<i>Swinbourne's</i> Picture Logic .....	6	<i>Zeller's</i> Plato.....	3
<i>Tancock's</i> England during the Wars,		Socrates .....	3
1778-1820 .....	3	Stoics, Epicureans, and Sceptics...	3
<i>Taylor's</i> History of India .....	2	<i>Zimmern's</i> Lessing .....	4
Ancient and Modern History ...	4	Schopenhauer .....	4





67



