LECTURES ON BRONCHIECTASIS.

Delivered at the Hospital for Consumption and Diseases of the Chest, Brompton.

By C. THEODORE WILLIAMS, M.A., M.D., F.R.C.P.,
Physician to the Hospital.

LECTURE II.

LET us now take some well-marked examples of bronchiectasis, and verify our description of the disease as given in the last lecture.

CASE I.—Alfred B., aged 35, a labourer from Buckinghamshire, was admitted October 14th, 1880.

History.—He had been subject to bronchitis for four years, and in 1876 he had cough with expectoration streaked with blood, pain in the left side below the nipple, and night-sweats. The symptoms lasted one month, at the end of which time the night-sweats ceased, but the cough and expectoration remained, and were accompanied by shortness of breath. These symptoms had continued up to the present time, and the dyspnoea had gradually increased. In addition, he had had two attacks of pleuropneumonia similar to the one in 1876, the last occurring in June of this year.

On admission, his aspect was florid and healthy. He had lost about 7 lbs. in weight since July. Cough was frequent and convulsive. Expectoration was abundant; about a pint in twenty-four hours, partly frothy, partly mucous, with some large lumps of mucus. It also contained colouring matter and a considerable amount of lung-tissue. The breath was very short on exertion. Both breath and expectoration were very foetid. His weight was 10 st. Bowels regular; tongue clean; and pulse normal.

Physical Signs (see Fig. 1).—On the left side were flattening and impaired movement in the subclavian and lower mammary regions, the flattening being most marked in the latter (D). There was slight dulness to the second rib, with increased vocal vibration (A). Crepitation on cough was audible from the clavicle to the third rib (C). In the second intercostal space, close to the sternum, over a space as large as a five-shilling piece, was heard cavernous gurgles (B). He was ordered *mistura ætheris cum ammoniâ* three times a day.

Fig. 1. - Bronchiectasis.

December 3rd, 1880. The cough had diminished, and the expectoration considerably lessened in extent in the last six weeks, but had shown a few occasional streaks of blood. The patient had suffered from dyspepsia.

REMARKS.—This patient has evidently had several attacks of pleuropneumonia, the result of which is to be seen in the flattening and contraction of the lower left front chest, with adhesion of the pleura. It is quite possible that there exist dilated bronchial tubes of the cylindrical variety in the lower lobe of this lung, originating in the way described by Hamilton, but at present the physical signs do not indicate this. In the upper lobe, the cavernous breathing near the sternum, its jarring nature, and peculiar locality, indicate the existence of a dilated bronchus in that region. As a contrast to the physical signs of this case, I have

annexed those of an ordinary case of tubercular cavity (Fig. 2), where part of the right upper lobe is the seat of excavation. It will be noted that dulness is present, and that the cavernous sounds are chiefly audible in the middle portion of the first intercostal space, and not at its sternal end, as in Case I.

Fig. 2.—Phthisis (1st stage). A denotes dulness; B denotes area of cavernous sounds.

CASE II. George H., aged 27, married, by trade a ship's steward, was admitted into Brompton Hospital April 13th, 1880. There was no history of consumption in his family. His habits were somewhat intemperate. He had been subject to winter-cough for some years; and, about three years ago, when employed in managing a hydraulic lift, he suddenly brought up a large quantity of blood. The hæmorrhage was accompanied by cough, and lasted about a week; but he was confined to bed by the consequent illness for seven months. On recovery, he relinquished his former occupation, and went to sea as a steward. During his last voyage, he suffered from severe sickness, and, on his return, gave up all work, and attended as an out-patient at Southampton Hospital, having lost some flesh.

On admission, he had a troublesome cough, with considerable expectoration, which was muco-purulent and very offensive, as was also the breath. He had frequent nausea and vomiting. Pulse 104; temperature 98.2° Fahr.; respirations 18; weight 7 st. 9 lbs.

Physical Signs (Fig. 3).—On the right side there was excessive resonance (E) over the whole front, most marked in the mammary region. Tubular breathing (A) was heard from the clavicle to the upper border of the third rib. Cavernous sounds (B) could be detected in the first interspace, over a space extending two inches to the right of the sternum. The left side was superresonant throughout, and, over the lower third, anteriorly and posteriorly, crepitation (D) was audible.

Fig. 3. - Bronchiectasis.

The patient was ordered *mistura ætheris cum ammoniâ*, with 10 minims of glycerine of carbolic acid, three times a day, and a turpentine inhalation. The diagnosis was emphysema, with bronchiectasis in the right upper lobe, and interstitial pneumonia of the lower lobe of the left lung.

May 27th. He had remained about the same. The cough had been very troublesome; the expectoration from a quarter to half a pint, and foetid; it contained no lung-tissue. The sickness had been checked by bismuth; after this, inhalations of carbolic acid, tar-water, and turpentine were successively tried, with a view to reduce the foetor, but failed. He had gained 3½ lbs. in weight. Wheezing and rhonchus were audible over the whole left lung, and crepitation still at the base.

June 24th. The patient had had an attack of diarrhoea and vomiting. The expectoration had diminished, but still was foetid. There was less rhonchus in the left lung, but more crepitation at the base.

June 30th. For the last four days, expectoration had been comparatively scanty. On the 29th, during an attack of vomiting, the patient brought up a considerable quantity of thick, foetid, and extremely purulent material, the last sputum being streaked with blood. Since then he had complained of headache. Pulse 120; temperature 100° Fahr.; bowels open twice; tongue red in the centre, and coated on each side. The rhonchus had disappeared from the lungs. As the inhalations and medicines by the mouth failed to purify the pulmonary secretion, I followed the example of Dr. Pepper of New York, and injected 24 minims of a solution of iodine (1 in 60) through the first intercostal space, about three-fourths of an inch from the right border of the sternum, selecting the spot where cavernous sounds were most audible. The hypodermic syringe entered without any difficulty, and the fluid did not return, but the patient complained of pain in the second space and extending down the right arm. In the evening, the temperature was 98.4° Fahr.

July 1st. The expectoration, being tested, gave no trace of iodine, and was unchanged. Some tenderness existed at the spot of the puncture. Pulse 100; temperature 99° Fahr.

July 6th. Expectoration had been more frothy. The patient had had a rigor, and his temperature has risen to 100.2°; in consequence of this, any further operation had been postponed.

July 8th. He had had no fresh rigor. Temperature 98.4°; pulse 92; respirations 18. Measurements showed the antero-posterior diameter of the right side to be a quarter of an inch less than that of the left. After consultation with Drs. Douglas Powell, Tatham, and Ewart, it was decided to puncture the second interspace two inches to the right of the sternum; and accordingly, after the skin had been frozen, a trocar and cannula of the smallest size were passed by Dr. Hicks through the selected spot to the depth of two inches, in an upward and backward direction. On withdrawing the trocar, pus and mucus welled up, and air hissed through. Thirteen minims of the iodine solution (1 in 30) were then injected. The patient coughed violently, and expectorated a large quantity of the usual foetid material. Twenty minims more of the iodine were injected, and iodine was at once detected in the expectoration, the patient also complaining of a metallic taste in his mouth. It was then decided to keep a tube in the cavity, and, as the cannula was somewhat too long, another and shorter one was inserted, and held in place by cross pieces of plaister. The operation was well borne, but a pain was experienced in the region of the wound on movement.

July 9th. He had passed a bad night, and complained of the pain. His cough was troublesome; expectoration half a pint, and very offensive; it now contained no trace of iodine. The tube was quite patent, but no discharge issued from it. Fifteen minims of iodine solution were injected; this was followed by violent coughing and profuse expectoration, including some of the solution.

July 11th. Cough and expectoration were about the same. He had no pain in the region of the wound. Temperature 99°; respirations 20.

July 13th. Expectoration was rather more abundant (three-fourths of a pint). An attempt to inject two ounces of Condyl's fluid through the cannula failed, the fluid returning by the side of the instrument. A second attempt, after the cannula had been washed and replaced, likewise failed.

July 16th. The cough was troublesome; expectoration about half a pint, very foetid. Another attempt was made to introduce a cannula half an inch on the inner side of the last opening, and succeeded, a larger and longer one being inserted, and three ounces of Condyl's fluid injected and retained. Three days later, the expectoration meanwhile having been scanty and less foetid, the patient complained greatly of the annoyance of the tube, and in the evening it was found displaced. Dr. Hicks suspected that the patient himself had removed it.

August 23rd. During the last five weeks, no satisfactory progress had been made. A period of scanty expectoration had always been followed by pyrexia and profuse foetid discharge from the lungs, accompanied by vomiting and sometimes by diarrhoea. Two more attempts at instrumental relief had failed. During the last few days, the patient had hardly expectorated at all. At 3 P.M. on the 22nd, he had a rigor, and brought up three pints of extremely foetid expectoration. The temperature rose to 103°, and the pulse to 130.

August 25th. As the attempts to drain off the foetid matter from the right lung had failed, a consultation was held with Dr. Douglas Powell as to the advisability of attempting to perforate a bronchus in the left lung, especially in the lower lobe, which was known to be the seat of interstitial pneumonia, and might consequently be that of bronchial

dilatation. The physical signs here were as follows: from the level of the eighth spinous process downwards, slight dullness, more marked below the tenth rib; crepitation scattered over this region; below the tenth rib, croaking sounds on cough. After the patient had been placed in a hanging position over the edge of the bed, which caused expectoration, the above-mentioned dullness slightly diminished.

Though the signs were slight, yet, with a view of obviating the approaching danger of septic poisoning, an operation was decided on, and a trocar with cannula of medium size was passed through the eighth interspace, about three inches to the left of the spine, in a direction forwards and inwards. The trocar met with scarcely any resistance, as was also the case with a catheter (No. 1) passed through afterwards. After the operation, the patient expectorated about half a pint. No air nor discharge escaped through the tube.

September 5th. The tube had been retained up to to-day, but the patient complained much of pain in its neighbourhood; and, as no discharge had issued from it, it was withdrawn.

After this date, expectoration became more and more difficult, the sputum more foetid, and the patient only got rid of the accumulation after fits of coughing which ended in vomiting. The temperature remained at 103° Fahr., with occasional depressions; the pulse between 120 and 130; the respirations became more frequent and laboured. Auscultation showed the whole of the left lung to be the seat of pneumonia, probably of septic origin.

On September 16th, the patient became livid, and, after severe dyspnoea, died.

NECROPSY (seventeen hours after death).—On removing the sternum and ribs, the left lung was found highly emphysematous, and extending across the median line. The heart was displaced downwards, the apex being situated at the lower margin of the ribs, one inch to the right of the left vertical mammary line. The right ventricle was slightly dilated. The left lung, with the exception of the emphysema above mentioned, which was noted chiefly along the anterior border and at the base, was in a state of red hepatization. Some of the bronchial tubes were dilated and thickened. In the lower lobe, not far from the posterior surface, was a smooth lined bronchiectasis, in shape and size like a filbert. The pleura was adherent at the apex and at the posterior base, where it was thickened, and showed a jelly-like consistence. The pneumonia was due to inhaled secretion, and of recent production. Unfortunately, no attempt was made to trace the course of the operation on the left lung, and to discover the path of the trocar, until too late in the dissection to recognise the parts as when in position during life. The right lung had the pleura adherent at the apex and base. At the base was the same jelly-like material in the pleural meshes as had been noted in the left pleura. The bronchi were largely dilated in the globular form, the dilatation commencing from the division of the trachea. On tracing the subdivisions of the right bronchus, several dilated portions were found; but in the right upper lobe, corresponding with the portion of lung underlying the first and second intercostal spaces, a division of the bronchus was traced into a series of labyrinthine cavities, which altogether occupied an elongated space amounting to the size of a hen's egg. These spaces opened into each other, and were lined by a smooth glistening membrane continuous with that of the bronchus. They extended nearly to the pleural surface. The tracks of puncture through the walls of this cavity were made out in several places, showing that the bronchus had been reached by operation. Some dilations of the bronchi were found in the lower and middle lobes, but were not so well marked and extensive as in the upper lobe. The whole of the right lung was crepitant, and a great part emphysematous. There was some pulmonary oedema.

REMARKS.—This case exemplifies in many ways the characteristics of bronchiectasis. The history, as in most instances, was very obscure; and, beyond the winter-cough and the occasional hæmorrhage, we have little to lay hold of before he came under observation. The two principal facts on which the diagnosis was founded were (1) the cough and expectoration, (2) the physical signs.

The expectoration was a mixture of frothy mucus and very offensive pus, and the difficulty of expectorating was extreme. Towards the end of his life, the poor fellow could only relieve his bronchial tubes by hanging himself over the edge of his bed, and then, by a mixture of coughing and vomiting, he brought up some of the secretion. Sometimes he failed to accomplish even this, and the expectoration would accumulate for two or three days, at the end of which time a rigor appeared, followed by high temperature, showing probable absorption of some of the poison; he would then expectorate a pint and a half or two pints of foetid material, when the temperature fell and relief was experienced.

The physical signs which pointed to the diagnosis were the combination of hyperresonance on percussion, indicative of emphysema, with

cavernous sounds heard nearer to the sternum than is usually the case in tuberculous cavities. The entire absence of signs on the posterior surface of the apex also strengthened the opinion.

The great contrast between this case and cases of phthisis was shown in the weight, which, in spite of his sufferings, increased up to his death, instead of diminishing.

Death appeared to have taken place by septicæmia. The *post mortem* examination demonstrated two things: 1. The success of the operations in reaching the bronchiectasis; 2. The doubtful value of operations in these cases. This is because, as a rule, there is not one, but many bronchiectases, and the secretion is of that character which cannot be drawn through a tube, or, in other words, tapped. What strikes one most, in contemplating this case, is the remarkable non-vulnerability of the patient's system: six formidable operations, one after another, were performed without creating constitutional disturbance even so far as to give a slight rise of temperature.

CASE III.—J. S. E., a baker, aged 51, was admitted on November 16th, 1880.

History.—He had been subject to winter-cough and expectoration for ten years, accompanied by shortness of breath on exertion. The cough had usually ceased in summer, but the dyspnoea has persisted. Two years ago, he was confined to his bed with cough and pain in the side for three months, accompanied by slight hæmoptysis. Last August, he had hæmoptysis to the amount of a quart, extending over two or three days, the blood being bright red, and unmixed with mucus. He had occasionally had night sweats, and, for the last four years, had lost flesh amounting in all to two stone.

On admission, his cough was troublesome. Expectoration was muco-purulent, abundant, about a third of a pint daily. His breath was short; aspect healthy; frame well knit, and chest large. Tongue clean. Bowels regular. His appetite was good. Weight 10 st. 1 lb. Pulse 70; respirations 25; temperature 100° Fahr. (evening).

Physical Signs.—Harsh tubular breathing was audible in the first interspace on the left side, but there was no dullness. On the right side posteriorly was some dullness; crepitation, tubular sound, and jarring bronchophony existed over the lower half (A, Fig. 4). Cavernous breath and gurgle were audible over the lower and inner portion (B). Below the angle of the left scapula, crepitation and some tubular sounds were heard over a limited surface (C).

Fig. 4.—Bronchiectasis.]

February 1881. This patient has improved greatly. Cough is less troublesome. The expectoration is reduced to about an ounce of frothy mucus daily. He has gained eight pounds in weight. His breath is easier on exertion. The temperature and pulse are normal.

Physical Signs.—No crepitation is audible in the left lung; in the right, the crepitation has diminished, and the loud cavernous sounds have become more tubular in character. In this case, several bronchial tubes were dilated; but the one which gave rise to most of the patient's symptoms was situated at the base of the right lung. From the physical signs, it would appear that some reduction in the size of the bronchial tube took place; or, what is more probable, some absorption of the surrounding consolidation.

DIAGNOSIS.—The only condition from which it is necessary to diagnose bronchiectasis is that of tubercular cavity; unless, perhaps, we may mention the rare condition of a localised empyema bursting into a bronchus. In this latter case, the history and symptoms would generally preclude a mistake. In the diagnosis from tubercular cavity, we must depend on (1) the age of the patient; bronchiectasis occurs principally in middle-aged persons, phthisis in younger ones, though, of course, it may be found at various ages; (2) on the aspect, which, in bronchiectasis, is, as a rule, tolerably healthy, contrasting strongly with the cachexia of phthisis; (3) on the absence of loss of weight and the

presence of dyspnoea out of all proportion to the physical signs; next, we rely on (4) the character of the cough and expectoration; and, lastly, on certain features of the (5) physical signs—viz., on their localised and stationary character, on the loudness of the cavernous breathing contrasted with the small amount of accompanying dullness, and the jarring nature of the voice-sounds, and on the peculiar situations in which the sounds are audible. The loudness of the cavernous breathing and the jarring nature of the voice-sounds were well shown in a case which I communicated to the Clinical Society (*Clin. Transactions*, vol. xii), where a labyrinthine cavity, whose diameter in no part exceeded one inch, gave rise to a loud cavernous sound over the lower third of the posterior surface of one lung.

PROGNOSIS.—Do bronchiectases ever heal? *i.e.*, does the bronchus ever regain its original lumen? Barth maintains that they do occasionally. Biermer states that cicatrices may form in the smaller bronchi. It is not uncommon, he observes, to find in fibroid phthisis some of the dilated bronchi cut off from the bronchial tree, and encysted by fibrosis. I confess, however, I have never seen the cicatrices mentioned by Biermer.

In some cases of bronchiectasis, where no fresh irritating cause arises, the patient may continue *in statu quo* and live on for years, his strength availing to sufficiently evacuate the dilatations, and thus prevent plugging of the bronchi, or secondary inflammatory changes in their walls. This is a favourable outlook. In most cases, however, the prognosis is far more gloomy: either a fresh catarrh, causing fresh secretion, adds to the patient's difficulties by blocking a certain number of the dilated tubes, and thus brings about death by suffocation; or the secretions accumulate to that extent in the bronchial tree, that the terminal bronchi at length open by ulceration on to the pleural surface, and death by pyopneumothorax is the result. The third or most common ending is what occurred in two of my cases—septicæmic poisoning of the opposite lung. When expectoration of the foetid matter has become exceedingly difficult, and great expiratory force is needed to effect even a partial clearance of the tubes, we may be sure that septic pneumonia will soon supervene; for each expiratory effort is followed by deep inspirations, which render the inhalation of the foetid matter into the sound lung tolerably certain. How different is the future of a localised tubercular cavity! For here we know that life may be prolonged in comfort for many years, its contents being regularly and efficiently got rid of by morning and evening expectoration. But in bronchiectasis we have a mechanical obstacle in the form of the rigidity of the tubes, which is fatal to all effective drainage, and leads in time to self-poisoning.

TREATMENT.—The chief principles to be kept in view are: (1) the prevention of fresh catarrh; (2) the stimulation of the walls of the bronchi, so as to bring into play any muscular tissue that remains; and (3) the improvement in the character and amount of the bronchial secretion.

The first point is arrived at by keeping the patient as far as possible in an equable atmosphere, and at the same time bracing his frame and power of enduring changes of atmosphere by cold sponging and salt baths, warm and cold. There is no doubt, too, that cold affusion is a very effective way of stimulating respiration and expectoration, and thus attaining the second point of treatment. In many cases, the most effective evacuation of the bronchial tubes takes place after the morning sponge-bath; and the chief good of the douches applied by our German brethren to the chest lies in the deep inspirations and expirations which they induce, these promoting expectoration. Stimulation of the bronchial muscle is difficult in bronchiectasis, because often very little of the muscular element remains; but it should be attempted by aid of strong expectorants and diffusible stimulants. These may be introduced either by the stomach in form of spiritus ætheris, carbonate of ammonia, oil of turpentine in capsules, tinctures of benzoin, tolu, senega, and larch, capsules de goudron, and such like; or directly to the air-passages, by the use of handball spray-apparatus containing solutions of ipecacuanha wine, tar-water, and carbolic acid. But, according to my experience, these have proved of little avail, chiefly because cold fluids are ungenial to a congested and inflamed mucous membrane; and, on the other hand, warm inhalations appear to penetrate far deeper into the air-passages, and are more soothing to the patient. The best forms are compound tincture of benzoin (two drachms to the pint of boiling water), oil of turpentine (23 to 30 minims), thymol, pinus sylvestris, and juniper, inhaled night and morning from a pint jug with a wide mouth, with a napkin arranged like a funnel to conduct the vapours to the patient's nose and mouth. The third point is best attained by anti-septic inhalations, such as glycerine of carbolic acid (two to four drachms to the pint), creasote (ten minims to the pint), tar-water, all of which tend to correct the foetor, and to reduce the amount of secretion. It has often occurred to me that the ordinary methods of

inhalation are a very imperfect mode of applying remedial agents to the lungs. The effort of inhalation, and even of using sprays, is very fatiguing to the patient, and prevents their application more than two or three times daily. A far better way would be to impregnate the atmosphere of a chamber with a very small percentage of the required drug, as well as warming and moistening it so that the patient could continually inhale it without effort. Wire-respirators, arranged to cover both nose and mouth, between the layers of which lint and sponge soaked in various solutions are placed, have also proved beneficial in cases of bronchiectasis. When, however, none of these means enable the patient to get rid of the accumulating secretions, what is to be done to prevent death by septicæmia? Are we justified in tapping the bronchiectasis? Assuredly we are, if we can be certain that the dilatation is limited to one set of bronchi, and is not a general condition of the bronchi of both lungs. In too many instances, this latter is the case, and then operation is useless. Emetics may be resorted to as an occasional measure of relief; but such a general dilatation of the bronchial tree is a very hopeless condition with which to deal. The dietary ought to be most generous, including a fair amount of stimulant in the form of brandy or whiskey, which, mixed with warm water, assists expectoration. The marine stimulating climates, such as Brighton, Eastbourne, Margate, Ramsgate, Yarmouth, Whitby, and Scarborough, do most good in these cases.

ABSTRACT OF LECTURES

ON THE

ANATOMY, PHYSIOLOGY, AND ZOOLOGY OF THE CETACEA.

Delivered at the Royal College of Surgeons of England.

By W. H. FLOWER, F.R.S., LL.D.,

Hunterian Professor of Comparative Anatomy.

LECTURE VI.—THE GREENLAND WHALE—(continued).

THE vertebral column of the Greenland whale differs from that of the lesser rorqual chiefly in size and in the cervical region. In the former, the cervical vertebrae, which are seven in number, are ankylosed together, while in the latter they are separate. The ankylosis is not confined to the centra, but also takes place between the spinous processes, and is present from birth. The remaining portion of the spinal column is composed of thirteen dorsal, fourteen lumbar, and twenty-two caudal vertebrae. The sternum is heart-shaped, and has a single rib articulated with it on each side. The extremities only differ in details from those of the *Balenoptera*. The scapula is higher and narrower; the humerus, radius, and ulna are rather shorter; while the hand is broader, and has a small rudimentary thumb. The pelvis and hind limbs are better developed than in the *Balenoptera*. The innominate bone is somewhat triangular in shape, with a nodule of bone, which represents the femur, united by fibrous tissue to its outer surface. To the lower end of this rudimentary femur is attached a second bony nodule of smaller size, representing the tibia; but there is no bone corresponding to the fibula. The joint between the innominate and femur is fairly complete, and Professor Struthers has shown, in a paper recently published in the *Journal of Anatomy and Physiology*, that muscles may be traced passing from the pelvis to the femur, though they are of small size and faintly developed. The tympanic bone is ankylosed to the mastoid process, and to the petrous portion of the temporal bone in the *Balenoptera*. The malleus is ankylosed to the tympanic bone, through the medium of the processus gracilis.

The number of species of right whales is not precisely known; but recent researches seem to indicate that there are only two distinct forms—namely, the Greenland whale (*Balæna mysticetus*), and the *Balæna* which inhabits the temperate seas. The latter, of which there are several varieties named, has been found very widely distributed. One variety, with a comparatively small head, has been caught on our own coasts, and on the Atlantic coasts of Europe and North America. To this animal the name of Atlantic whale (*Balæna Biscayensis*) has been given. A specimen of this whale was caught, in 1878, in the Mediterranean. A second variety, probably of the same species, has been obtained off the Cape of Good Hope, and on the coasts of New

Zealand; it has received the name of *Balæna Australis*. A very young specimen of it, from the Cape, is preserved and mounted in the western museum. A third variety has long been known to the Japanese, on the coasts of Japan. Of this variety, nothing is known except from a Japanese book, in which there are several pictures of whale-fishing, and from the accounts of the fishermen of the coast of California. Though different names have been given to those whales, according to the localities where they have been found, it is extremely doubtful that they are actually different species. Much information is, however, required regarding them before the number of species can be determined with accuracy.

The *Balenoptera* are the most widely spread family of the cetacea, being found in almost all seas. They are all timid animals; many of them are of large size, and rapid swimmers. Four distinct species are found on our coasts. These are:

1. *Balenoptera musculus*, which is of a black colour on the dorsal aspect, and light on the ventral surface. The upper surfaces of its anterior extremities are black, without any streaks. Its sternum is broad.

2. *Balenoptera Sibbaldii*, the largest of all the whales, being sometimes as long as twenty-four metres (eighty feet). It is rarer in our seas, though sometimes caught on the north coasts of Scotland, but more abundant on the coasts of Norway, where it is hunted and shot with explosive harpoons. It is of grey colour, with black whalebone.

3. *Balenoptera borealis* is also one of the rarer forms. Its first rib is peculiar, in being always double at its upper extremity, which causes it to present an appearance as if a cervical rib had been fused with the true first rib. This character has been found in other whales, but never with the same constancy as in this species.

Balenoptera rostrata is the last and smallest species of the family, and has already been fully described. All the other *Balenoptera* which have been described by Gray and others, are so closely allied to one or other of these forms as to be undistinguishable from them.

Intermediate between the *Balæna* and the *Balenoptera* are three forms of whale: the humpbacks, the *Megaptera*; the *Neobalæna*, or *Balæna marginata*; and the Californian grey whale, *Rachianectes*. The *Megaptera* has the skin of its throat thrown into folds like that of the *Balenoptera*. The anterior extremities are remarkable for their length. On each manus there are four digits. The phalanges are numerous, there being as many as nine present in the middle digit. A low dorsal fin is developed, and the cervical vertebrae are separate. The geographical distribution of this animal is very wide; it is found on our coasts, at the Cape of Good Hope, and in New Zealand, Japan, and many other places. It is infested with two kinds of barnacles—namely, the coronula and otion—which may frequently be found attached to the tail and fins.

The *Neobalæna*, or *Balæna marginata*, is found off the coasts of New Zealand. Its whalebone is long and narrow, and the hairs attached to the inner margin are long and very fine. There are no folds of skin on the anterior part of the chest, and the cervical vertebrae are ankylosed. It resembles in these respects the *Balæna*, but differs in possessing a dorsal fin and four digits.

The Californian grey whale, *Rachianectes*, has been hunted for a long time, though little is known of its anatomy. It resembles the *Balæna* in possessing no skin-folds on the chest and no dorsal fin, but has only four digits, and the cervical vertebrae are separate. The whalebone is very coarse. The points of resemblance of these forms to the *Balæna* or to the *Balenoptera* will be more clearly illustrated by the following table.

	Skin-Folds on Throat.	Number of Digits.	State of Cervical Vertebrae.	Presence or absence of Dorsal Fin.
<i>Balæna</i>	Absent	5	Ankylosed	Absent
<i>Neobalæna</i>	Absent	4	Ankylosed	Present
<i>Rachianectes</i>	Absent	4	Separate	Absent
<i>Megaptera</i>	Present	4	Separate	Present
<i>Balenoptera</i>	Present	4	Separate	Present

BEQUESTS.—The late Mr. Thomas Biggart of Bardland Hill, Dalry, bequeathed to the Association for the Relief of Incurables, Glasgow and West of Scotland, £500; to the Glasgow Convalescent Home, Lenzie, £100; to the Seaside Convalescent Home, Kilmun, £100; to the Western Infirmary, Glasgow, £200; while he also directed that £500 be set apart for a number of years, and the interest paid to the West of Scotland Convalescent Home, Dunoon, for the benefit of sick-poor from Dalry, who may require the benefit of a period of residence at the Home; this sum ultimately to be paid over for behoof of the said Homes.