that it was untrue. But the benefit conferred is nevertheless real and substantial. No delusive hope of cure is held out to the consumptive toiler, but a new lease of life, though a short one, has been vouchsafed to him. A certain amount of earning power, which would otherwise have been lost, has been restored to him, and through him to the community of which he is a member. As regards the individual, it may seem of little importance whether the struggle is long or short, whether he dies now or two or three years hence, whether he is wholly incapacitated or able to earn a certain proportion only of what he earned before; but if any means can be devised whereby a respite of even a few years may be secured to our tens of thousands of phthisical workmen, we are bound as Christians and as citizens to use them.

HOW CAN SANATORIA BE SUPPLIED IN ENGLAND?

And now I come to my last point—to the most difficult question of all. Granted that sanatoria for the poor are a national necessity, how can this need be supplied in England?

Many will, I know, be inclined to shelve the question, considering it scarcely worth while to prolong a struggle which in each case must eventually and at no distant period end in death, or that no practical result can come of discussing it; but those who admit that human life is of more value than anything else in the world, and that we have to gather up the fragments that remain even of consumptive life, that nothing be lost, will join with me in considering calmly and without prejudice whether there is any way by which the consumptive toiler can be effectually helped to keep hold of that remainder.

I do not recommend that we should imitate what has been done in Germany, but that we should ascertain what have been the essential conditions of success, and what are the reasons why they should not be realised in this country. These essential conditions relate:

1. To the choice of suitable sites and the erection and maintenance of suitable buildings.
2. To the selection of suitable cases, and to their prompt admission.
3. To the regulation under medical supervision of the time of residence of each invalid; and
4. To the medical supervision of invalids after their discharge from the sanatorium.

It is obvious that the carrying out of these indications all over England could not fail to require an enormous initial and annual expenditure of money. We have seen that German sanatoria have already cost more than a million for building and installation, and that their maintenance already costs a quarter of a million, and will soon cost three or four times as much. There is no reason for supposing that if we followed their example we should do so more economically.

It may, perhaps, facilitate the consideration of the subject if we assume, as I think we may, that the cost of erection of sanatoria might be met by grants from public bodies or by private benevolence. But it can scarcely be supposed that the current expenditure of these institutions could be supplied by voluntary contributions. Here, as in Germany, the sanatoria ought to be self-supporting; they must depend for their maintenance on the earnings of those benefited by them.

The German system of compulsory insurance against sickness is in reality a tax on labour, to the payment of which employers and employed contribute in something like equal proportion. Although, however, in principle there can be no more objection to the imposition of a tax on the earning of a workman who receives under £2 a week than to the tax which those whose incomes are not so very much larger submit to at the present moment with so little grumbling, it is not the less certain that in England any attempt to levy such a tax on the working man would not be tolerated. The most feasible way of accomplishing the end in view seems to be that the employers of labour should consent to levy upon themselves a contribution of which the amount would be proportional to and deductible in whole or in part from the wages paid to their workmen, on whom therefore their due share of the burden would ultimately fall. Such a system would be but a poor substitute for a compulsory system including earners of every class. Within its limited scope it would give equal or greater advantages to the insured, and would probably yield the

means of maintaining a sufficient number of sanatoria for their reception when incapacitated by illness. But so far from being universal, it would exclude toilers of the poorer class—those who in Germany chiefly benefit from the operation of compulsory insurance. It would, moreover, fail as a means of promoting the timely removal of phthisical breadearners from their homes and thus preventing the spread of phthisis among the overcrowded population of our towns.

I have now come to the end of my task. I have placed before you the question of sanatoria for the sons and daughters of toil with all its difficulties. I have endeavoured neither to over-estimate its drawbacks nor to exaggerate its advantages.

The question is in the hands of the medical profession. In all matters which concern the bodily welfare of the people, our function is to furnish to those who are responsible for the government of the country guiding principles.

With reference to the present subject an experiment on a very large scale has been made for us in Germany. It is our duty to examine into the results, not for the purpose of imitating or adopting German methods, but with the view of making up our minds on a question of principle.

This question is whether on the one hand we should leave the consumptive breadearner to struggle against his disease as best he may, contenting ourselves with promoting sanitary improvement and prophylactic measures against contagion, or on the other hand should, without in the least disregarding these objects or relaxing our efforts to prevent the spread of the disease, strive to organise a plan for enabling him to make the best of his life and earning power.

I venture to hope that this great question will be taken up by the approaching Congress and that the medical profession will be thereby awakened to its importance.

NOTE AND REFERENCE.

¹ Engelmann, Die deutschen Lungenheilstätten auf der Weltausstellung, *Zeitschrift für Tuberculose*, etc., vol. 1, p. 217. ² For information as to the system of compulsory insurance see Düttmann and Gebhard's *Handausgabe des Invaliden-versicherungs-gesetzes*, Altenburg, 1900.

A CLINICAL LECTURE

ON

THE ARREST OF PULMONARY TUBERCULOSIS.

Delivered at the London Medical Graduates' College and Polyclinic, June 12th, 1901,

By C. THEODORE WILLIAMS, M.A., M.D., F.R.C.P.,
Consulting Physician to the Hospital for Consumption and Diseases of the Chest, Brompton.

GENTLEMEN,—The subject of the arrest of tuberculosis has been chosen for the clinical lecture to-day because the approaching British Congress of Tuberculosis and the great attention given to open-air treatment of the disease has brought the subject much to the front, and various and widely differing interpretations of the term "cure" are at present in circulation.

The expression is not a happy one, especially when applied to a disease marked by insidious spread, and whose subjects are always ready to take a too hopeful view of their own cases. "Arrest" is a better term, but should only be accepted with the proviso that it is to include both local and general condition of the patient, as unless both are satisfactory the arrest of tuberculosis cannot be considered complete.

QUIESCENT AND OBSOLESCENT TUBERCLE.

Let us first trace out the pathology of the arrest of tubercle. Supposing a tuberculous mass has become quiescent and gives rise to no signs or symptoms, we generally assume that it is encapsuled in a fibrous envelope, and that all connection with a bronchus is cut off.

Such masses, generally caseous, are often found at necropsies in the lungs of consumptives, and in these caseous masses tubercle bacilli can often be detected. In many instances grey or milky tubercle is transformed into

fibroid tissue, that conversion being well described by Professor Hamilton,¹ who demonstrates step by step how the periplast of the adjoining giant cells form processes which, stretching out, become united, and constitute a fibrous structure, and later on a reticular one, in the meshes of which the original nuclei lie embedded. Thus the miliary tubercle is converted into fibroid tissue.

In this last case it is difficult to conceive that the tissue can break down, but in the case of imprisoned caseous masses their softening and absorption, leading to fresh local infection, is quite intelligible.

EMPHYSEMA AROUND OBSOLESCENT TUBERCLE.

Another form of arrest is where a tuberculous nodule, or mass, becomes obsolescent and is surrounded by chronic local pulmonary emphysema, which often prevents the detection of the tubercle by physical signs. This has been well described by the late Sir William Jenner,² who points out the close connection of this form of emphysema with apical tubercle.

When tubercles obsolesce or calcify at the apex of the lung, a considerable portion of the lung tissue in their vicinity is usually the seat of chronic congestion and exudation of lymph. This portion of lung loses its porosity, becomes tough, inelastic, and puckered, that is, irregularly contracted, but here and there some portion of lung is damaged, not destroyed, so that some air vesicles still admit air. In health the inspiratory and expiratory forces are at a minimum at the apex, but during expiratory efforts with closed glottis, as in severe cough, the air is driven from the more compressed parts into the little compressed apex, and thus the vesicles still pervious to air are distended, and as their walls have, from the previous changes in the tissues of the apex of the lung, lost much of their elasticity, the over-distension is permanent.

How often we detect over an apex well-marked resonance where dulness formerly prevailed, and in some cases we note, especially during cough, a bulging above the clavicle which is quite characteristic of emphysema. In some patients the emphysema is far more extensive, and is to be found along the anterior border and at the base of the lung and not rarely throughout both organs.

This is one of the commonest endings of tubercle and the owner of the lungs which have gone through this process is generally a short-breathed individual with a large motionless chest, and often liable to wheezing. He is credited with being an asthmatic and sometimes suffers from paroxysmal dyspnoea. After death his lungs are found largely emphysematous, and when incised show several old cavities, which have undergone partial contraction and have their bronchi blocked. Such lungs are usually deeply pigmented and the bronchial glands swollen and also pigmented. This last is an interesting feature, as it explains the occurrence of asthma. The bronchial glands during the process of absorption of the disintegrated tubercle become swollen and thus press on the pulmonary plexuses and induce bronchial spasm.

The rôle of the bronchial glands must always be taken into account in old tuberculous cases. The wheezy short-breathed individual, with a chronic cough, is by no means a rare example of arrested phthisis and I have known such patients become fat and ruddy and present all the appearance of good health, barring the short breath. Many eventually perish by an attack of hæmoptysis through the cracking of some degenerated vessel exposed in the old cavity or the bursting of a small pulmonary aneurysm.

CONTRACTION OF CAVITIES.

A not infrequent and conspicuous form of arrest of consumption is that in which a cavity, situated in the upper lobe of one lung, undergoes contraction, and we are able by physical signs to recognise the various steps of the process. The increase of fibrosis causes a shrinking of the whole lung, the walls of the cavity approximate, and in some cases meet and cicatrise. We note the shifting of the area of cavernous sounds first upwards and then backwards to the interscapular region, whence they may in time disappear altogether; then accompanying this is the displacement of neighbouring organs, the opposite lung being drawn across the median line, the heart, and stomach, or liver (according to the side) drawn up, sometimes the lower lobe of the lung replacing the upper lobe containing the cavity, and the chest wall being flattened, the circumference lessened, and, in extreme cases, the spine curved and the shoulder of that side lowered.

Post-mortem observations show that complete cicatrization of a cavity is a very rare event but its contraction a fairly common one. In cutting through a lung invaded by fibrosis

we often come across old cavities evidently shrunk in capacity, and with the bronchus leading to them blocked. Such a cavity, it need hardly be remarked, would give rise to no auscultatory signs, and would yield no sputum for analysis.

CALCAREOUS DEGENERATION.

In addition to the fibrous transformation of tubercle there is the calcareous degeneration, which is often seen in necroses, and specimens of which are frequently expectorated during life.

Calcareous matter is generally found either in the centre of large caseous masses in the lung, or is scattered through fibrotic lungs, representing apparently the extinct or obsolete tubercle. Sometimes a calcareous mass of considerable size is found in the upper lobe of a lung surrounded by fibrosis, the remains of a former cavity.

Calcareous matter undoubtedly indicates the obsolescence of tubercle, but it is found oftener in the bronchial glands than in the lung tissue itself, and much of the calcareous expectoration comes from the bronchial glands opening into bronchi by ulceration and thus discharging their contents.

Calcareous expectoration by itself must not be accepted as a proof of the arrest of tuberculosis, for a patient may be expectorating cretaceous matter and at the same time present signs and symptoms of active disease proceeding. In more than one instance I remember calcareous expectoration has been followed by profuse hæmoptysis, and in others I have noted it in cases of pyrexial phthisis.

Naturally we infer that in the first case we have the detachment of a calcareous mass from a cavity wall causing rupture of a degenerated blood vessel, and in the second that obsolescent tubercle may be present in one lung, or a part of it, and active tuberculosis in another part or else in the opposite lung. It is one of the disappointing features of consumption that continuance of quiescence cannot always be reckoned on, but that the disease may be stirred into activity by exciting causes as will presently be shown.

These are the modes of arrest of pulmonary tuberculosis, and I propose in their light to consider the probabilities of the arrest of consumption, and then to apply the knowledge they teach to the numerous clinical examples of arrest we see in daily practice.

CLINICAL ASPECTS OF ARRESTED PHTHISIS.

There are a number of young men and women of ages between 18 and 30, who give a history of phthisical symptoms of some weeks or months, have tubercle bacilli in their sputum and present physical signs of consolidation at one or both apices. These under appropriate treatment for half a year or a year lose their symptoms, the tubercle bacilli in the sputum disappear and most of their physical signs; and after high altitude treatment frequently all the signs. They have generally gained in strength and largely in weight. These patients are often classed as "cures."

As for the pathological condition of their lungs, it is probable that the tubercle at the apex has undergone in part caseation and in part fibrosis, and that their apices contain some small caseous masses embedded in fibrotic and healthy lung. No doubt in most of these patients the disease is arrested, but it cannot be called cured, for a change of surroundings from healthy to unhealthy, or overwork, or an attack of some lowering disease like influenza will cause a return of the phthisical symptoms, tubercle bacilli will reappear in the sputum, softening of the apex will follow and a cavity be duly detected by physical signs. This may occur after long periods of good health, as is shown by the following:

A shorthand writer, aged 23, who was largely engaged in night work, broke down and presented symptoms and signs of tubercle at the right apex in April, 1879. He was sent to Davos and returned after three months' stay in good health and free from physical signs, with some gain of weight and with his chest enlarged.

By my advice he changed his occupation for one less sedentary and laborious, and went on well till 1881, when he had acute pneumonia, from which he completely recovered, and the lungs after the attack presented no signs of fresh tuberculous mischief. He remained well and quite stout till the winter of 1900, when he had several profuse hæmoptyses and tubercle bacilli were detected in the blood expectorated. The physical signs demonstrated the formation of a cavity in the upper lobe of the right lung.

This patient has since recovered and returned to work, but nineteen years of immunity from symptoms did not protect him from a recurrence of the disease, and the quiescent

tubercle was lit up afresh. Some authorities would regard this as an instance of fresh infection, but in any case the constitution was still liable to attack.

A military officer, aged 20, seen by me on September 9th, 1886, with Surgeon-Major Parry, had well-marked tuberculosis of the left upper lobe with a phthisical history. He was ordered to St. Moritz, and returned to England in May, 1887, having quite recovered in spite of a severe accident to his shoulder when tobogganing. I detected still some thickening at the left apex, but the thorax was greatly enlarged, the breathing was excellent, and the patient appeared the picture of health. He returned to regimental duty, and continued well and active for eleven years, when his voice became affected owing to catarrh, which passed off, but cough with expectoration continued, moist crepitation became audible at the left apex, and he was sent to an English sanatorium for three months. Here he improved, and gained 1½ stone in weight, became well bronzed by exposure, but though returned to me "a cured case," had still cough and expectoration, and physical signs at the left apex.

This shows that even after eleven years an arrested case is not quite free from the danger of relapse. Other instances might be cited from my notebooks, though there is as a rule less liability to relapse in early cases of tuberculation than in those in which a cavity has formed. These we will now consider.

In many cases of contracted cavity the lung is found shrunk to the size of a fist, and to consist of a dark fibroid tissue, containing cretaceous matter, and on section the old cavity is seen much diminished in size and partly cicatrised, with the bronchi leading to it blocked. I present you an example of this, and an inspection of the specimen will show why no further breaking down of the lung took place during the patient's life. The case was one of three instances of rapid contraction of cavities in phthisis communicated by me to the Clinical Society in 1871.

The patient was a woman, aged 53, a widow, who was admitted into the Brompton Hospital under my care with one year's history of pleurisy followed by phthisis, and a well-marked cavity in the left upper lobe, the sounds being audible from the clavicle to the third rib. She came into the wards in April, 1871, and in three months cavernous sounds were no longer audible, and the patient had lost her cough and expectoration, and had gained 1½ stone in weight. The physical signs showed the right lung to be drawn across the median line, the heart was drawn up, and the stomach note reached to the fourth rib. In April, 1872, she had a severe attack of capillary bronchitis, in which the dyspnoea was so great and the lividity so marked that it seemed impossible for her to survive, but she recovered on this occasion, and died in an attack of congestion of the lungs in January, 1875.

The post-mortem examination showed the left lung to be contracted, not weighing more than 9 ozs., and with a greatly thickened pleura. The lung lay at the back of the pleural cavity having evidently contracted toward its own root. It was dark grey in colour, and in a state of fibrosis. At about an inch below the apex, nearer to the posterior than the anterior margin, were the remains of an old cavity of very irregular shape, the size of a date stone. The cavity was partly cicatrised, and the rest of the lung contained some cretaceous material. The right lung was highly emphysematous.

When fibrosis is so extensive and firm as in this case, there is not much fear of any breaking down of the lung during life, but this patient was greatly incommoded by shortness of breath. She, however, did not die of phthisis, and the contracted cavity did not break down.

That patients are not always so fortunate may be shown by the following case:

A banker's clerk, aged 27, seen by me in consultation with Mr. Kempster, of Battersea, in 1871, suffered from acute phthisis of six weeks' duration and fistula in ano. The pulse was 120, and the temperature 102.2° F. A cavity sufficiently extensive to give rise to tinkling sounds rapidly formed in the upper left lung, but as rapidly began to contract, and after two months it could no longer be detected. The man gained weight, and lost his cough, and returned to professional work, remaining well till the close of 1875, when after sundry catarrhal attacks the larynx became affected, cavities formed in the upper lobes of both lungs, and tubercle spread throughout the lower lobes. He died December, 1878, eight years after his first symptoms.

Here we must conclude that the lung tissue was not completely converted into fibrous tissue, but that caseous matter remained in the neighbourhood of the old cavity, separated but not completely cut off from the channels of infection, and under the depressing circumstances of the patient became softened and afterwards absorbed, and hence the breaking down of the apices and the dissemination of miliary tubercle.

From this evidence you will have no difficulty in coming to the conclusion that the permanent arrest of tuberculosis is not such a simple matter, but surrounded by considerable difficulties, and, glancing at the foregoing instances, one is tempted to imitate Solon's famous dictum and say—Pro-nounce no case one of arrested tuberculosis till you have seen the necropsy.

THE STATISTICS OF ARREST.

On the other hand, there are certainly a large number of instances of arrest of consumption revealed to us in the post-

mortem room. Dr. Kingston Fowler³ noted in 2,400 necropsies at the Middlesex Hospital obsolete tuberculous lesions in 9 per cent. How often do we find in the necropsies of patients dying from other diseases the remains of old tubercle at the apices of the lungs, and can trace in the history of the case an account of phthisical symptoms. How often do we during life find in a patient brought us for bronchitis or asthma some signs of an old quiescent cavity, the discharge from which has been looked upon as bronchitic, or else a contracted cavity with no discharge at all. When, however, we read without explanation in the statistics of German sanatoria, supplied by Dr. Rufenacht Walter's excellent work,⁴ that at one sanatorium 11 per cent. were "cured," and 15.6 per cent. nearly cured; and at another 22.23 per cent. "apparently cured"; and in another 81 per cent. first-stage cases "apparently cured," we hold our breath and wish to know a little more about these cases. Some sanatoria appear to be more modest in their description of results, and are content to give only "improved" and "worse," and it must be admitted as proved that the number of "improved" of all cases, varying from 62 to 95.3 is most satisfactory. But one sanatorium claims 81 per cent. "apparently cured" and 100 per cent. "improved"!

In very few is any distinction made between general and local results, which is most important, for though a patient may add 1 or even 3 stone to weight, become brown as a berry, and even regain strength, if the cough continues and signs of active mischief are still detected in the lungs, this general improvement may at any time vanish when the tubercle spreads or assumes fresh activity. In Dr. Gebhard's careful statistics of the Hanseatic and Old Age Insurance Company a difference between general and local results is attempted and the contrast is striking. General improvement took place in 85.5 per cent. and local improvement in only 58.1 per cent.

Another test of arrest of disease is the one used by the Imperial Board of Insurance of Germany, namely, the ability of the consumptive to return to work, and, according to Mr. Rube's paper,⁵ of 8,200 insured men and women 71 per cent. left the sanatoria fit for work. There is much to recommend this form of test, but it cannot be accepted as a scientific proof of arrest of tuberculosis, for a large portion of the Brompton out-patients continue their work, being obliged to do so to support themselves or their families, though an examination of their chests would hardly show all these cases to be ones of arrest of tuberculosis. The fact of a man returning to work proves a certain standard of strength or improvement but not necessarily that the disease is arrested, and this can only be proved by the local condition being pronounced satisfactory. With respect to the use of the term "cured," I am conscious of being open to criticism for having employed it myself in a paper in the *Medico-Chirurgical Transactions*, but though I took pains to define it to prevent misconception, I regret I used this word, and have avoided it ever since. Arrest is a more appropriate term, and should only be applied when all general symptoms have ceased, when there is no longer cough and expectoration, night sweats or wasting, and the physical signs are either absent altogether, or, in the case of former cavities, signs of consolidation or contracted cavity have replaced those of the active cavity.

REFERENCES.

- ¹ *Pathology of Bronchitis*, p. 137. ² *Reynolds's System of Medicine*, vol. iii. ³ *Diseases of the Lungs*. ⁴ *Sanatoria for Consumptives*, p. 53. ⁵ *Tuberculosis*, January, 1901.

PRESENTATIONS.—Dr. J. Lloyd Roberts, lately President of the North Wales Branch of the British Medical Association, has been presented, on the occasion of leaving Denbigh to reside at Colwyn Bay, with an illuminated address and a purse of sovereigns, in recognition of his services for twenty-six years as an honorary medical officer of the Denbighshire Infirmary. The past and present resident medical and nursing staffs presented him at the same time with a silver coffee-jug.—Dr. Stewart Lockie, Consulting Physician to the Cumberland Infirmary, Carlisle, has been presented with a testimonial consisting of a cheque of £300, a silver flower bowl, and an album containing the names of the subscribers, who place on record their appreciation of his services, especially in connection with the medical charities of the city and district.