

a cupful or more may be brought up in an hour or two. Fragments of fibrous tissue only appear in it when cavities are forming. At this period there may be one or more hæmorrhages. Detritus of caseous matter containing the bacillus, softening, is found in the sputa only at this later period. The onset of tuberculosis is announced by increase of dyspnœa, rise of the temperature, alterations in the voice, and diarrhœa. The development of the connective tissue and the compression of the vessels lead to dilatation of the right cavities of the heart, stasis of the venous system, and congestion of the liver and kidneys. Œdema of the feet and ankles is first observed; then swelling of the legs and scrotum, and ascites appear.

**Physical Signs of Phthisis.**—There are no points of difference as respects the physical signs of phthisis; hence the three forms may be considered together.

The abnormality in the development of the chest, which is observed in phthisical subjects, has been already described. In the movements

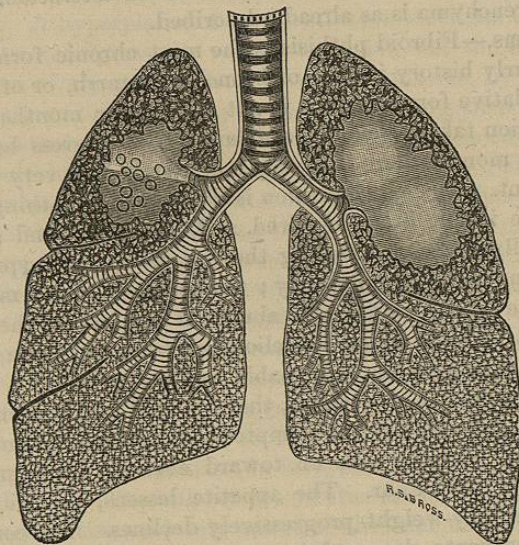


FIG. 36.—Cavities; one partly filled, one empty. (Da Costa.)

of the ribs during expansion in *inspiration*, deficiency may be observed to exist on the diseased side. On *palpation*, increase of the vocal fremitus exists over consolidated lung and over cavities, and is diminished or wanting over effusion in the pleural cavity. The percussion-note has great variety. All shades of dullness exist. If the consolidation is not complete and some air still enters the diseased area, the note is high-pitched, but with a somewhat tympanitic quality; but if the tissue is entirely without air, then the note is high-pitched and hard in quality. The change in sonority may be unilateral or double, but if double

it is not necessarily symmetrical; it may be infra-clavicular on one side, infra-spinous on the other. The dullness may be due to various causes—to a pleuritic effusion, to pneumonic consolidation, or to a tumor or cyst. The extension of the area of dullness and the increase in hardness or the disappearance of the tympanitic quality may indicate the increase of the tubercular or caseous deposition. The change in the sonority of the lung is most usually at the apex, but it may be in any situation. During the process of softening and extrusion there is no change in the character of the percussion-note until excavations have formed; even then there will be no change, unless the cavity be large and near the surface. The percussion-note may present a nearly normal sonority or it may be exaggerated over a cavity; it may have a metallic clang, or amphoric quality; it may, if the cavity communicate with a bronchus, have the cracked-pot sound (*bruit de pot fêlé*). The last is produced by strong percussion, the vibrations occurring in the walls of the cavity and in the column of air in the bronchus. A cavity in which pus has accumulated may furnish a dull sound; when emptied, the amphoric sound will return. On auscultation the sounds audible will present great variety. The vesicular murmur will be unimpaired in those parts free from disease; it will be feeble or indistinct if many bronchioles are obstructed; it will be rude or blowing if the bronchioles are narrowed; inspiration will be jerking and expiration prolonged and blowing if the lung has lost its elasticity from any cause. These signs are much less significant when they occur on the right than when they occur on the left side (infra-clavicular regions); in the former situation, they are, so to speak, normal. Next to these modifications in the respiratory murmurs are certain adventitious sounds, or *râles*. The earliest of these audible in the infra-clavicular region usually is a fine, dry, crackling sound (sub-crepitant) appearing at the end of inspiration, and sometimes requiring a deep and full inspiration to develop it. This *râle* may be temporary, when it has but little significance. The extension of the inflammation to the larger bronchi induces more abundant secretions, and the sub-crepitant *râle* becomes a distinctly moist sound, and audible over a larger area, and coarser sounds also moist—mucous *râles*—are mixed with them. With these *râles* changes in the respiratory sounds take place: inspiration has a distinct *blowing* character which approximates to and ultimately does become *bronchophonic*—i. e., the sound of the movement of the air in the bronchial tubes and of the voice are communicated to the ear directly, the solidified lung acting as a good conductor, the respiratory or vesicular murmur having disappeared. These are the sounds of consolidation, and of softening up to extrusion. When cavities form, new sounds become audible, but it is not always easy to differentiate between bronchophony and *amphoric* and *cavernous blowing*, the signs of a cavity. Amphoric blowing and

amphoric voice are signs of a cavity, if correctly interpreted; the *cavernous sounds* produced in a large cavity with thin walls are more significant. To these must be added *metallic tinkling*, which is heard in perfection in hydropneumothorax and under similar conditions when the cavity is large.

**Course, Duration, and Termination.**—The course of phthisis is much influenced by its form. Phthisis florida, or acute caseous phthisis, runs its course in a few months, and not often with intermissions, although it does sometimes intermit, and then pursue a more chronic course. Its usual course is continuous—a large part of one or of both lungs may be occluded, softening occurs, and high fever with rapid emaciation soon exhausts the powers of life. The usual type of caseous phthisis is chronic; there are repeated bronchial attacks and gradually increasing consolidation, the interval between the attacks being characterized by varying degrees of improvement, but with a general tendency toward decline. In many, it is true, under judicious management, the catarrhal process is arrested, absorption of the caseous matter takes place in part, the rest is extruded, with more or less destruction of tissue; cicatricial tissue supplies the place, contraction ensues, with subsequent retraction of the chest-wall, and thus, in a limited sense, a cure is effected. In other cases the course is less marked by intermissions, the caseous deposits are extensive, and there are hæmorrhages, fever, emaciation—the symptoms continuing until death. While the duration of the former type may be two, three, and as much as five years, or during the ordinary duration of life, the latter do not often extend two years. The tuberculous form also pursues two different courses: one chronic, developing slowly, lasting two years or more; the other more rapid, the whole course being terminated within a year. The degree in which broncho-pneumonia, atelectasis, and dilatation of the bronchioles occur, the extension of the tuberculosis to the larynx and intestinal canal, and the number and severity of the hæmorrhages, are important factors in bringing about a fatal result. So long as the tubercular deposit is limited to the lung, is slight in extent, there is a possibility of recovery by extrusion, shrinking of the lung, and retraction of the ribs. The most chronic of all the forms of phthisis is the fibroid. The course of this may occupy several years, indeed an ordinary lifetime, and prove fatal at last. Of all the forms, it offers the best prospect of a cure, if the changes are not too extensive. The initial period, terminating in a bronchiectasis, may occupy a number of years; at first, for several years, there is winter cough only, the warm season being free, or nearly so; when the connective tissue of the lung is invaded the progress is more rapid, for then atelectasis and caseation enter as elements into the destructive changes. Finally, tuberculosis is ingrafted into the morbid process, which then advances more rapidly, because not only the lungs, but the

larynx and intestinal canal, become diseased; the range of temperature rises higher, and emaciation proceeds at an accelerated pace. Phthisis is the great enemy of the human race, since nearly two sevenths of the deaths from all causes are due to this disease. But a few years ago, a cure of any case was regarded as hopeless; but within recent times the improvements in our knowledge of the local conditions and in the means of treatment have led to better results, and cures are now not uncommon.

**Diagnosis.**—The diagnosis of phthisis can not be doubtful after the initial period. Incipient phthisis may be confounded with atonic dyspepsia. A cough may be present in atonic dyspepsia—the so-called stomach-cough. The natural differences in the sonority and the respiration of the right and left infra-clavicular regions may materially contribute to the error. Attention to this, and to the fact that there is no point of irritation about the air-passages to account for the existence of a cough, will settle the doubts. More frequently, in malarious regions, is hectic fever confounded with intermittent, since in the latter there is usually some cough. This mistake is made when the pulmonary disease is quite advanced, so that the error is either from ignorance or carelessness. In phthisis, independently of the physical signs, the fever has been preceded by a period of cough, and loss of flesh and strength, whereas in intermittent these symptoms have followed the access of fever; in phthisis there is not, in intermittent there is, an enlarged spleen; in phthisis the hectic is not arrested by large doses of quinine; in intermittent the fever is arrested and convalescence is at once established. A careful study of the physical signs ought at once decide the question. Laryngeal symptoms are often so pronounced in the beginning as to obscure the pulmonary affection. Indeed, the disease in the lungs is referred by some to the larynx, to which it is regarded as strictly secondary. This error has arisen from the fact that considerable infiltration of the lung may exist without seriously impairing its sonority, or changing or modifying the vesicular murmur. When tubercular deposits occur in the larynx, the tone and quality of the voice are quickly affected, so that the latter may seem to be the only seat of tubercular deposit. Although, to determine this question, time may be necessary, the coexistence of pulmonary disease ought to be suspected, because of the relation known to obtain between them. The most important diagnostic question relates to the difference between caseous and tuberculous phthisis. The sections devoted to these two forms have indicated the clinical and pathological differences; nevertheless, it will be useful to state briefly the points which serve to distinguish them. Tubercular phthisis is distinctly hereditary; caseous phthisis is not hereditary, but occurs in the scrofulous. Tubercular phthisis occurs at all ages; caseous, from youth to middle age. Tubercular phthisis occurs insidiously

with catarrh of the bronchi and larynx; caseous results from acute inflammations of the bronchi and lungs. Tubercular phthisis is more often than the caseous a cause of pulmonary hæmorrhage. In tubercular phthisis the lesions are apt to be on both sides; in caseous, on one side. In tuberculosis of the lung, tubercle may be widely disseminated without any striking physical signs; in caseous phthisis the caseous deposits produce very pronounced physical symptoms. The laryngeal symptoms are much more common in tubercular than in caseous phthisis. The progress in tuberculous phthisis is more rapid and the mortality greater than in caseous. Fibroid phthisis is distinguished from the other forms by its slow progress, by the long period of bronchial troubles before the pulmonary lesions begin, by the merely purulent expectoration, without fibrous tissue, until late in the progress of the case, and by bronchial dilatation long before the cavities by excavation form.

**Treatment.**—When a phthisical tendency exists, prophylaxis becomes highly important. Although not often consulted, physicians should discourage, directly and indirectly, the marriage of the phthisical. Children inheriting the dyscrasia should have a careful physical training, substantial food, warm clothing, and exercise in the open air without exposure. They should be guarded against attacks of bronchial catarrh, of measles, and whooping-cough, for in these diseases the seeds are sown of future mischief. As humidity is such an important factor in the etiology of phthisis, and as dryness and elevation are climatic conditions of the greatest utility, if possible, the growing child should be separated from the one and placed in the other. Singing should be encouraged, since that tends directly to improve the nutrition of the lung, especially of the apex. Cold bathing should be practiced every morning to diminish the susceptibility to cold. Catarrhal attacks occurring should receive prompt attention, and any lingering remnant of local morbid action should be carefully removed. The tendency to such attacks and the removal of the effects produced by them are equally controlled by the iodides (iodide of iron) and cod-liver oil. As phthisis is preëminently a wasting disease, it is highly important to put the organs concerned in nutrition into the highest state of efficiency. In tubercular and fibroid phthisis, among the earliest symptoms are stomach disorders, poor appetite, atonic or acid indigestion, and especially repugnance to the fatty elements of food. The mineral acids, with a bitter, such as tincture of *nux vomica*, are especially serviceable. If there be acid eructations, pyrosis, and heart-burn, the mineral acids, especially nitric (ten to fifteen drops, well diluted, *ter in die*), should be administered before meals; but, if the condition be atonic indigestion, the acid should be given after meals. The *nux-vomica* tincture should be given before meals—fifteen drops in water. The aliment should consist of easily digested articles of diet,

and the stomach should not be overloaded under any circumstances. It should never be forgotten that it is not the quantity swallowed, but digested and assimilated, which contributes to the nourishment of the body. There are certain tonics to the stomach which stimulate the organ to more efficient work, that are very beneficial in promoting the nutrition of the body. These are, besides the bitters and mineral acids mentioned above, small doses of arsenic and silver, and alcohol. Arsenic is deserving of special commendation—in incipient phthisis, to promote the appetite and favor tissue-forming, while it corrects the disordered state of the stomach mucous membrane, and as a remedy for chronic tuberculosis and fibroid lung. The author must impress on his readers that arsenic must be given in small doses, as it is to be continued for a long period (two drops three times a day). The oxide of silver performs much the same office, but its administration must be brief, because of the danger of coloring the skin (*Argyria*). Small doses of alcohol after meals (half an ounce for adults) are highly useful to promote appetite and tissue-formation. Physicians should not encourage the dangerous notion that whisky is antidotal to phthisis. Fibroid phthisis appears to be produced by chronic alcoholism. Large quantities of alcoholic fluids impair the function of digestion, and lessen tissue-forming; hence the amount named—certainly not more than twice as much—should not be exceeded. The utility of cod-liver oil in incipient phthisis is very great. As the power to digest fats is confined within narrow limits, and as the ability to dispose of them is relatively less in consumption, the dose of cod-liver oil should be prescribed accordingly, from a tea- to a tablespoonful—a teaspoonful the usual dose. All in excess of the capacity to digest passes unchanged, and may be seen floating on the evacuations. The utility of cod-liver oil consists in the fact that it is a fat, having a special digestibility, owing to its containing bile elements, and is therefore peculiarly fitted to form the “molecular basis of the chyle.” It is not useful in cases of *phthisis florida*, or in caseous phthisis characterized by large deposits, high fever, and diarrhœa; but in chronic tuberculosis and fibroid phthisis. In what form soever it may be given, it is better to prescribe it with a little ether (℞ xx—3 j), because of the action of the ether in promoting the flow of pancreatic fluid—a fact demonstrated by Bernard, and confirmed by clinical observation. Cod-liver oil may be given in the form of emulsion with the lactophosphate of lime, the compound hypophosphites, and the compound phosphates. The simultaneous administration of these remedies is good practice, and the emulsion may be allowed, if the quality of the cod-liver oil is good, but it should not be overlooked that an inferior oil may be disguised in an emulsion of this kind. The lactophosphate of lime, if well prepared, is a most valuable agent in the treatment of incipient and the more chronic cases of phthisis. The hypophosphites,

although not deserving the encomiums first pronounced on them as remedies for consumption, are valuable agents to promote the constructive metamorphosis. It is doubtful whether the hypophosphites present any advantages over the phosphates, because of their chemical instability and rapid conversion into the phosphates. The lactophosphate of lime has the special advantage that it is a soluble combination of an agent very important to the construction of tissue. The last-named remedy may be given in a dose of a tea- to a dessertspoonful of the sirup three times a day, after meals.

Recent experiences have shown that creosote is an important remedy. There is reason to believe that it has distinct curative power in suitable cases. The more chronic forms, and the condition of slow but extending disease, there being but slight fever and the perspiration moderate, are those most amenable to the treatment by creosote. Beginning with one minim, the dose is increased by minims until the full capacity of the patient is reached. There are some remarkable instances of improvement by the accidental administration of large quantities—almost toxic doses. Although from one to five minims may be stated as the usual dose, much more may be given by judicious and gradual increase in the amount. It is wood creosote and not carbolic acid that is meant here; although there is very close correspondence, there is not identity of composition. Besides the stomachal administration of creosote, it can be given by inhalation vaporized. Guttman has shown that tubercle bacilli are destroyed by creosote in a  $\frac{1}{4000}$  solution. Sommerbrodt finds that if a sufficient amount, approximating the standard of Guttman, is given, the result is most satisfactory. The amount required is estimated as one gramme for a man weighing 160 pounds. He begins with nearly one grain to a capsule, of which he gives three the first day, four the second, five the third, and on at this rate till twenty are taken daily, and the results have been highly satisfactory.

Large doses of tannic acid ( $\text{Dj}$ ), increased to an amount that seems almost incredible, have also lately been used, it is said, with curative results.

As the presence of a parasite—the bacillus tuberculosis—has an intimate relation to the morbid process, it is important to check its development by aerial or volatile remedies that can be given by inhalation. The value of antiseptics by the method of *protracted inhalation* is just being recognized, but I urge on my readers that the utility of mode of inhalation should have their serious attention. The method consists in charging the air of a suitable apartment with a volatile remedy which the patient can breathe—for a considerable length of time—for a half-hour, an hour, or even longer.

The method of germicide treatment by rectal injection of sulph-hydrogen and carbonic acid was brought forward with such loud promises of the good done by it that in an incredibly short time it was

being practiced in all civilized countries. It fell into disuse in this country as rapidly as it was taken up, partly because the mode of operating is unpleasant, and the results, although undeniably good, are not sufficient to counterbalance the disgust. The method, however, proved that the inhalation of certain gases having germicide power is one of the most effective means of treating phthisis.

The gases and vapors now employed in this disease are chiefly carbonic acid, sulphurous acid, and sulphuretted hydrogen; but the vapors are more numerous. By the atomization of solutions the number and variety of medicaments employed in the treatment of pulmonary affections become enormous. I hope I may not be considered egotistic and prejudiced when I say that this mode of using the remedies is not good—is not effective, certainly, in anything like the proportion that the promoters maintain. I advise the inhalation by the protracted method of ethyl iodide, carbolic acid, carbolic acid and tincture of iodine, bromine (very cautiously) iodol, iodoform, oxygen, etc.

The time when the most good is accomplished by germicide agents is before the bacillus has penetrated so far that excavations are forming. There is more to be expected in the chronic cases without cavities, for here the element of time is in favor of the result.

Cases of phthisis have been recently related as cured by the inhalation of highly heated air. If the air is deprived of its moisture the temperature at which it can be inhaled ranges from 150° Fahr., to 300° Fahr. This method is based on the power of heat to inhibit or destroy the bacillus. It is probable that this mode of treatment will develop into a highly successful one.

Some of the chief symptoms require remedies to restrain them within proper limits, as cough, fever, sweats, hæmorrhage, laryngeal symptoms, and diarrhœa. These we consider in turn. If *cough* is very distressing, some relief becomes necessary, and the constant temptation is to resort to anodynes. Gargling the throat with a solution of bromide of potassium, applying a mixture of chloral and camphor by means of a camel's-hair brush to the fauces, the atomization of a solution of cocaine, or of morphine, are expedients temporarily beneficial. Fothergill's prescription of hydrobromic acid (diluted) and spirit of chloroform sometimes acts well, but is often inefficient. Of the principles contained in opium, codeine is the least objectionable; it causes less disturbance of the digestive organs, and has more effect on cough. A combination of codeine, atropine, and strychnine is highly efficient as a remedy for cough, for night-sweats, and reflex vomiting. Picrotoxin allays the vomiting which accompanies the cough almost as efficiently as strychnine, and has at the same time decided anhydrotic effect. A resolute patient may suppress cough to a very great extent by an effort of the will. The irritable feeling in the fauces may be allayed by a bit of gum-arabic or candy, or a troche. The officinal troche of licorice and opium, or of morphine and ipe-

cac,\* or a troche containing a small quantity of cocaine ( $\frac{1}{8}$  to  $\frac{1}{4}$  gr.) may be employed in this way advantageously. In the treatment of the fever of phthisis, the first and most important remedy is rest. Under a mistaken notion of the value of exercise, phthical subjects, having a high fever, attempt an active out-door life. A very considerable increase of the normal increment of fever takes place when exercise is attempted, and a corresponding diminution when repose is enforced. As a high range of temperature is most injurious, it is necessary to reduce it as much as possible. The most effective antipyretics are antipyrin and quinine, administered in anticipation of the period of pyrexia. Digitalis is too nauseating to be used with advantage, and salicylic acid is more unpleasant in all respects and less efficient than quinine. The most powerful anhydrotic which we possess is atropine. For an adult about  $\frac{1}{60}$  of a grain at bed-hour usually suffices; but, as atropine seems to have a special action on the lungs in caseous pneumonia, it is better to give it in smaller doses ( $\frac{1}{100}$  to  $\frac{1}{150}$  grain) twice a day. Under its use there is often a remarkable improvement in the condition of the patient, not due solely to the arrest of night-sweats, but to some special property. The combination before referred to is a suitable form for the administration of atropine—with codeine and picrotoxin. Sometimes remarkably good results follow the use of picrotoxin, but it is far from being uniformly successful. If atropine fails, picrotoxin should be tried. Oxide of zinc, with belladonna extract, sometimes does well. Sponging the body with hot water, or vinegar and water, is a domestic remedy, which is refreshing. Remedies for the laryngeal symptoms can be applied directly, the hand being guided by the mirror. Nitrate of silver, carbolic acid, and iodoform are the medicaments most frequently thus used. Atomization and inhalation of vapors are, however, more useful and generally employed. Common salt, potassic chloride, ammonium chloride, corrosive chloride, tannic acid, carbolic acid alone or with tincture of iodine, creosote, ethyl iodide, are the remedies most frequently used in this way. Those used by atomization are dissolved in water, or in glycerin and water, for example, gr. ij of tannin to the ounce of water, the patient receiving the spray in the fauces. Inhalation of vapors, such as ethyl iodide, creosote, tincture of iodine, carbolic acid and tincture of iodine, is of unquestionable utility, and should constitute a part of the treatment in every case. The simplest means suffice to vaporize these agents, and the vapor can be drawn into the lungs by deep, slow inhalations.

The diarrhoea of phthisis is most difficult of control, and for obvious reasons—the tubercular deposit and the subsequent ulcerations.

\* Trochisci glycyrrhizæ et opii, each troche contains  $\frac{1}{60}$  grain of opium; trochisci morphinæ et ipecacuanhæ, each troche contains  $\frac{1}{40}$  grain of morphine and  $\frac{1}{12}$  ipecac.

Opium and acetate of lead, opium and tannin, opium and sulphuric acid, opium and arsenite of potassa, are among the principal remedies. Extract of logwood is highly esteemed by many English practitioners. The author has had better results from Fowler's solution and the tincture of opium than any other remedies (2 gtt. to 10 gtt.) except aromatic sulphuric acid and laudanum (15 gtt. to 10 gtt.). In the treatment of the diarrhoea frequent changes are necessary. A remedy that succeeds for a time will not continue to do so, and hence the resources of the physician are often severely tried.

The requisites of a climate for pulmonary invalids have been briefly stated; they are dryness and elevation. The health-resorts which offer these requisites in the highest perfection are the best. Those of North Carolina, South Carolina, Georgia, the Rocky Mountain regions, California, New Mexico, offer every variety. No change of climate, however, can be beneficial as a rule, after cavities have been formed, unless of slight extent. It is in incipient phthisis that a change to a climate dry, bracing, and elevated, really exerts a curative influence.

#### HÆMOPTYSIS—BRONCHO-PULMONARY HÆMORRHAGE.

Definition.—The word *hæmoptysis*, which means "spitting of blood," does not indicate the source of the hæmorrhage. *Broncho-pulmonary hæmorrhage* is a correct designation, for this expresses both the nature of the accident and the position of the disease. Bronchial hæmorrhage occurs from some part of the bronchi; pulmonary hæmorrhage consists of two forms—*pulmonary infarction*; *pulmonary apoplexy*—a hæmorrhage arising from embolic blocking of a branch of the pulmonary artery, the tissues of the lung being displaced merely in the former, but broken up in the latter.

Causes.—Pulmonary hæmorrhage is infrequent at the extremes of life, and is most common from youth up to middle life. It occurs in either sex in about the same ratio. An infarction presents a characteristic appearance of a wedge-shaped portion of the lung infiltrated with blood, and situated at the periphery of the lung, with the base of the wedge outwardly. Infarction is almost always associated with heart disease, in which heart-clots are formed on the right side, and emboli being detached pass into and obstruct a branch of the pulmonary artery. To cause an infarction, the artery obstructed must be a "terminal artery" in the sense intended by Cohnheim\*—that is, an artery without anastomoses, and dividing only into the final capillaries. When such a vessel is obstructed, the blood-current is arrested both in front and behind the point of obstruction, in the capillaries and veins, until they are joined by others. Then commences a backward current into the capillaries of the occluded vessel, and into the

\* "Untersuchungen ueber die embolischen Processe," Berlin, 1872, p. 74.