

processes. Plasmorrhexis may be regarded as the stage immediately preceding plasmoschisis.

*Adred Scott Warthin.*

**PLASMOSCHISIS.**—The partial or total disorganization of the cell through fragmentation or splitting of its protoplasm. It is characterized by the snaring off of the processes developed through plasmorrhexis, and the formation of round, oval, disc-like, angular, or thready bodies, which may be homogeneous or granular; or by the separation of the protoplasm from the nucleus. The term is used, particularly with reference to the disintegration of the red blood cells, as a synonym for *erythrocytoschisis*. It is believed by many investigators that the blood plates are nothing more than specially formed products of the plasmorrhexis and plasmoschisis of the red blood cells.

*Adred Scott Warthin.*

**PLASTIC SURGERY.** See *Reparative Surgery*.

**PLETHORA.** See *Circulation, Pathology of*.

**PLEURISY.**—The pleura may be the seat of various forms of inflammation, some of which are only a part of a general inflammation involving the tissue of the lung, as in pneumonia, tuberculosis of the lung, and emphysema of the lungs, and some of which involve the pleura without disease of the lung.

A pleurisy may be primary, or it may be secondary to disease of the lung, or to some general disease, as chronic nephritis or rheumatism.

The different forms of pleurisy may be conveniently classified as follows:

1. Pleurisy with the production of fibrin, or acute pleurisy, or dry pleurisy.
2. Pleurisy with the production of fibrin and serum, or sero-fibrinous pleurisy, or pleurisy with effusion, or subacute pleurisy.
3. Pleurisy with an excessive production of fibrin.
4. Pleurisy with the production of fibrin, serum, and pus, or empyema, or suppurative pleurisy.
5. Chronic pleurisy with adhesions.
6. Tuberculous pleurisy.
7. Cancerous pleurisy.
8. Traumatic pleurisy.

**ETIOLOGY.**—Pleurisy occurs at all ages and in both sexes. Pleurisy may be *primary* or *secondary*, but there is at the present time considerable difference in opinion as to the relative frequency of true primary pleurisy, as well as to the frequency of tuberculous infection as the essential factor in the production of so-called primary pleurisies. Thus Strümpell states that we know positively of but two forms which may be regarded as primary, viz., the traumatic and the rheumatic; while others regard exposure to cold and wet and individual predisposition as frequent exciting causes. Of late years, under the lead of the French and German writers, the tendency of a large number of the profession has been to regard the majority, if not all, of acute and subacute pleurisies as tuberculous. There seems, however, good reason to reject so sweeping an assumption. That the tubercle bacillus is a frequent cause of pleurisy is, of course, well known, but many cases of pleurisy with effusion have been observed in which no tubercle bacilli have been found in the exudate, and in which tuberculosis has not subsequently developed. Moreover, an exactly similar pleurisy with effusion has been produced experimentally in the lower animals by chemical agents, as is shown by Delafield. By injecting a saturated solution of chloride of zinc with a hypodermic syringe into the pleural cavity of the dog he was enabled to excite a pleurisy exactly resembling that which is seen in the human subject. By varying the amount of fluid injected he was able to obtain pleurisies of different degrees of intensity, and with different amounts of products of inflammation.

Pleurisy may be secondary to changes in the lungs, notably tuberculosis of the lungs and lobar pneumonia,

or to the infectious diseases, especially la grippe, to rheumatism, to peritonitis, to abscess of the liver, to carcinoma of the stomach, liver, or chest wall, or to nephritis.

**BACTERIOLOGY.**—Cultivations from the exudate give in the larger proportion of cases negative results, but, as stated by Netter, we may recognize three groups of acute or subacute pleurisy, caused by the tubercle bacillus, the pneumococcus, and the streptococcus respectively.

The tubercle bacillus is very difficult to find in the exudate. It has been demonstrated that a large amount of the exudate must be taken to make the test complete, either in cultures or in the inoculation of animals.

The pneumococcus pleurisy is almost always secondary to a focus of inflammation in the lung. It may, however, be primary. The exudate is usually purulent, but the prognosis of this form is very favorable. The streptococcus pleurisy is the typical septic form which may occur either from direct infection of the pleura through the lung in bronchopneumonia or in cases of streptococcus pneumonia; in other instances it follows infection of more distant parts. This is the most serious and fatal of all forms. The exudate is usually purulent.

These, then, are the important groups, but other bacteria have been found, as the staphylococcus, the typhoid bacillus, the bacillus coli communis, the gonococcus, the pneumobacillus of Friedländer, and the influenza bacillus.

**PLEURISY WITH THE PRODUCTION OF FIBRIN (DRY PLEURISY).**—*Morbid Anatomy.*—The inflammation may begin on the pulmonary, costal, or diaphragmatic pleura according to the cause which produces it. That beginning in the pulmonary pleura is always secondary to changes in the lungs. That which begins in the costal pleura is often independent of any inflammation of the lung. Usually only a circumscribed portion of the pulmonary, costal, mediastinal, or diaphragmatic pleura is involved, but the entire pleura of one side of the chest may be inflamed. The inflammation always extends to the portion of the pleura opposite to it. The inflamed pleura is coated with a more or less thick layer of fibrin, and bands of fibrin extend between the opposite pleural surfaces. As most persons recover from dry pleurisy, but little is known of its bacteriology.

This form of pleurisy is regularly seen with lobar pneumonia, less frequently with bronchopneumonia. It is very frequently associated with tuberculosis of the lungs, and may be the first or only sign of such tuberculosis. It is frequently found in connection with la grippe, and it may develop at any time in the course of this disease. It may develop simply from exposure to cold.

**Symptoms.**—The rational symptoms are usually few and not well marked. There may be more or less pain over the affected side, a slight dry cough, a little fever, and some malaise. Often these symptoms are absent. Though the pain is usually referred to the seat of inflammation, it must be remembered that this pain may be referred to a distant point, and thus the error may be made of regarding the case as one of lumbago or of appendicitis, of renal colic, or, in cases of diaphragmatic pleurisy, of peritonitis.

The physical signs are characteristic. Over the inflamed area are heard crepitant or subcrepitant râles. With these there may be a little dulness on percussion and some little diminution in the intensity of the breathing, but the essential sign is the presence of fine pleuritic râles. These râles may be scanty or very abundant. Sometimes they may be so faint as to be heard with the greatest difficulty. They are usually brought out best by causing the patient to cough. It must be remembered that these râles—contrary to the usual impression—are not necessarily constant; they may come and go in the same manner as a bronchial râle. If the pleurisy be diaphragmatic or mediastinal, no râles may be heard.

With acute or subacute miliary tuberculosis of the lung a dry pleurisy may either mark the invasion of the tuberculous inflammation of the lungs or it may be repeated from time to time as the tuberculosis goes on. Recent

pleuritic râles, pain in the chest, and a rise of temperature regularly accompany these attacks.

So well is it recognized that fine pleuritic râles may be the only symptom of a beginning tuberculosis that such evidence of localized dry pleurisy, especially if primarily at the apex of the lung and attended with afternoon fever, is always a source of great anxiety to the physician, unless he can be sure that he has to do with an acute pleurisy due to other cause than tuberculosis, as, for example, one occurring in the course of an attack of influenza. In primary dry pleurisies involving the costal pleura there is a great variation in the extent of pleura involved. The inflammation may involve only a small area of the pleura; there are râles heard over a circumscribed area only, the patient has but little fever, and the pleurisy runs its course in a week. In other cases the pleuritic râles are heard all over the front or back of the chest, the pain is quite severe, there is considerable fever, and the patient may be confined to bed or to the house for two weeks.

The prognosis is good. Most cases end in recovery after a short time, but the patient is often left with permanent thickenings and adhesions of the pleura. Such adhesions may give no further trouble, or they may form the starting-point for a chronic pleurisy with adhesions, or the process may go further and cause chronic interstitial pneumonia and chronic bronchitis.

Rarely, dry pleurisy is succeeded after several days by a pleurisy with effusion.

In a moderate number of cases one or more attacks of dry pleurisy are followed by pulmonary tuberculosis.

**Treatment.**—Many of the milder cases are never seen by the physician and need no treatment, although it would seem wise to keep them in the house till the pleuritic râles have disappeared. The more severe cases should stay in the house or go to bed till the attack has run its course. There is no especial drug treatment. The pain in the chest may be relieved by poultices, strapping the chest, opium, phenacetin, or the like. Most physicians either paint the affected chest with iodine or employ wet or dry cups, but it is doubtful if anything is gained by these counter-irritants.

**PLEURISY WITH THE PRODUCTION OF FIBRIN AND SERUM (PLEURISY WITH EFFUSION).**—This is a much more serious form of pleurisy, and is the type which is most commonly seen by the general practitioner, since many persons with acute dry pleurisy never consult a physician.

*Morbid Anatomy.*—The essential lesion is the inflammation of the greater part of the costal and pulmonary pleura on one side, and the accumulation of a considerable or large amount of serous fluid in the pleural cavity. Sometimes, however, the extent of the inflamed pleura is small, and the serum is shut in by adhesions (sacculated pleurisy).

Rarely, the pleurae of both sides of the chest are inflamed, and when this is the case there is apt to be *pericarditis* also.

The surface of the inflamed pleura is coated with fibrin, and bands of fibrin join together its opposed surfaces. In the pleural cavity is found clear or turbid serum of a straw or amber color, containing a few leucocytes. Red blood cells are so rarely found that a bloody effusion is usually regarded as a sign of a tuberculous or a cancerous pleurisy. The blood, however, may be due to an injury. There are, moreover, a few cases which do not differ from ordinary cases except that the fluid is bloody. Thus bloody fluid may be found in pleurisy in connection with cirrhosis of the liver and with infectious diseases. The quantity of fluid varies from a few ounces to a quantity sufficient completely to fill and distend the pleural cavity. The fluid is, of course, found in the most dependent part of the pleural cavity, unless shut in by adhesions, in which case it may be found anywhere, but most commonly at the base of the lung and in the neighborhood of the axillary region. If the effusion be of any considerable quantity the lung is compressed upward and backward against the vertebrae, the degree of

compression of the lung depending upon the amount of fluid. In extreme and long-continued cases the lung is almost un-aerated. If the amount of fluid be great the adjacent viscera may be displaced. After the inflammation has subsided the serum and fibrin are absorbed and the pleura is left thickened by connective tissue and with connective-tissue bands between the two layers. The compressed lung expands again either completely or partially; if the latter, more or less retraction of the affected side of the chest is left.

The causes of pleurisy with effusion have been already stated.

The behavior of the acute cases is such as to make it probable that infection by the pneumococcus is the cause of the inflammation; and this belief has been confirmed in a considerable number of cases, but, as before stated, in a large number of cases the fluid is found to be sterile.

The diagnosis is made by the symptoms and physical signs.

The essential symptoms are *pain* in the chest, *cough* with little or no expectoration, *dyspnoea*, and *fever*.

The essential physical signs are *absent*, or greatly diminished, *voal fremitus*, *flatness* on percussion, *feeble* or *absent breathing*, *feeble* or *absent voice*.

With this combination of symptoms and physical signs the diagnosis is one of the simplest problems in medicine, but there are so many variations from these conditions of the problem that a more extensive discussion of the subject is advisable.

First, as regards the symptoms and course of the disease. We may conveniently divide the symptoms of pleurisy with effusion into three groups:

1. Pleurisy with an acute invasion.
2. Pleurisy with an insidious invasion.
3. Pleurisy with a subacute invasion.

In the first group the symptoms may very closely resemble the invasion of lobar pneumonia.

In the second group the pleurisy may be entirely overlooked by the unwary, and "malaria" or some equally indefinite diagnosis may be made.

In the third group the conditions are more regular and the diagnosis more simple.

*First Group.*—In pleurisy with an acute invasion the patient is suddenly taken ill with the symptoms of an acute infection. Sometimes there is an initial chill, as in pneumonia; more often there are chilly feelings, and then the patient is taken with a sudden pain in the chest, with a high fever, 103°-104° F., a dry cough and immediate prostration. The pulse is full, 100-120, and the face is flushed. In a few hours dyspnoea appears, and this may increase so greatly that the patient cannot lie down in bed. The breathing is from 28 to 35. The pain is apt to be very great and referred to the affected side, but it may be also felt throughout the muscles of the body. The pain, on the other hand, may be very slight over the inflamed pleura, but is referred to the opposite side of the chest, or to the abdomen. In the latter case, if it be on the right side, the rigidity of the abdominal muscles and the situation of the pain may lead to the erroneous diagnosis of appendicitis, an error which of course would be corrected by a proper physical examination of the chest. As the fluid accumulates in the pleural cavity this pain becomes much less.

While the constitutional symptoms are going on the fluid accumulates rapidly, and within two days it may fill the pleural cavity; but the quantity of fluid varies greatly in different cases. The patient continues to have a high temperature and all the appearances of a severe illness for about two weeks; then the temperature subsides, leaving only a moderate afternoon fever, which continues as long as the fluid remains in the chest. These cases make us think of an infection of the pleura by the pneumococcus.

The prognosis is usually good, but sometimes death occurs, and some of these patients die suddenly. In the second group, that of insidious invasion, we have a picture which is just the opposite. The disease begins so gradually that the patient hardly knows when

he began to be ill. He has a little fever, he feels weak, has but little appetite, and he may feel short of breath on exertion, but the dyspnoea is not urgent. He may have no cough and no pain in the side, and he may go about his business for weeks suffering from fever and loss of flesh before the disease is recognized. For example, a gentleman coming from the South told me that he had suffered for three months from "malaria and an enlarged spleen." His dyspnoea was obvious to me at once, but he had hardly noticed it. His left chest was completely filled with fluid. The term "silent pleurisy" has been applied to this group of cases, and they are not infrequently tuberculous in their origin.

The duration depends entirely upon the length of time the fluid is left in the chest. If the fluid is removed recovery, as a rule, ensues at once—but tuberculosis of the lungs sometimes follows later; the interval may be weeks or months or years.

The *third group* is perhaps the most common. The invasion is of moderate severity; the temperature is about 101° F. in the morning and not usually above 103° F. in the afternoon; the respiration is about 30 and the pulse about 100; pain in the side, dry cough, and dyspnoea are prominent symptoms. The patients usually feel ill enough to go to bed, though they do not always do so. The fluid accumulates in the chest fairly quickly at first; then it continues to increase slowly, and if treatment is not instituted it will go on slowly increasing for several weeks.

The prognosis is good; these patients rarely die, and they usually make a perfect recovery.

The duration depends upon the treatment. Twenty years ago, when I was a hospital interne, the regular treatment was rest in bed, blisters to the chest and diuretics, and the regular duration was six weeks in bed and two months in hospital. Now the duration is often not more than two or three days in bed, and perhaps two weeks in hospital.

After recovery from this pleurisy changes in the chest may be left behind, which changes are in proportion to the quantity of fluid and the length of time it remains in the pleural cavity. The expansion of the lung may be complete, and no evidence of the former pleurisy remains. More often bands of connective-tissue adhesions are left between the opposing surfaces of the pleura, and the expansion of the lung is not complete. As a result there remains more or less retraction of the affected side of the chest, and the adhesions of the pleura may cause pain in the chest for several months; or, less frequently, these adhesions may be the starting-point of a chronic pleurisy with adhesions, of an interstitial pneumonia, or of a chronic bronchitis.

The *physical signs* of pleurisy with effusion depend largely upon the amount of the effusion and upon its situation. The rule is that we find the fluid in the lower part of the pleural cavity, and the lung more or less compressed upward and backward against the vertebral column. It is customary to describe the physical signs as in three groups, those above the level of the fluid, at the level of the fluid, and below the level of the fluid, but for the purposes of this article it will be sufficient to give the physical signs found above the level of the fluid and below the level of the fluid, as these are sufficient for all practical purposes.

*Inspection* may or may not show a fulness of the chest upon the affected side, and there is usually limitation of motion on the affected side. In children there may be bulging of the intercostal spaces below the level of the fluid. If the effusion be large there may be displacement of the heart or of the liver, but this displacement is not seen in cases of moderate effusion. There may be evident dyspnoea, and the patient usually lies upon the affected side.

The *vocal fremitus* is usually absent below the level of the fluid, but it may be only diminished even in large effusions.

*Percussion*, above the level of the fluid, may give exaggerated resonance, or skodaic resonance, or normal res-

onance. The percussion note over the opposite chest may be exaggerated or tympanitic. Below the level of the fluid the percussion note is usually absolutely flat, and this flatness together with the feeling of marked resistance to the finger used as a pleximeter is so constant a sign of fluid in the pleural cavity as to suggest at once the diagnosis without further physical signs, though it is not, of course, pathognomonic. In many cases, however, we do not get absolutely flatness, but only more or less marked dullness, even when the amount of fluid is considerable; this is notably the case in children. If the amount of fluid be small we get dullness on percussion of varying degrees of intensity.

Upon *auscultation* of the breathing, *above* the level of the fluid, the breathing is usually normal; it may be of a blowing character (cavernous or broncho-cavernous), or it may be feeble; *below* the level of the fluid it is generally stated that the breathing is *absent*, but this has not seemed to be the case to me. I should prefer to say that below the level of the fluid the breathing is quite feeble in most cases; exceptionally it is absent. There is another and most important exception to the character of the breathing heard all the way down the chest, below the level of the fluid, *viz.*, distinctly *bronchial breathing*. This characteristic of the breathing in many cases of pleural effusion is now quite generally recognized, but it is necessary to emphasize it on account of the danger of mistaking this breathing for that of consolidation of the lung. It is usually noted in cases of large pleural effusion; but this condition is by no means essential.

If the effusion be slight, the breathing is only slightly diminished in intensity or is normal.

The *voice* above the level of the fluid is usually normal; it may be exaggerated or it may be slightly diminished in intensity. Below the level of the fluid the voice is very greatly diminished or absent. If there be bronchial breathing there is usually bronchial voice also, and this bronchial voice often seems distant from the ear. If the effusion be moderate in amount, there may be only slightly diminished voice or there may be agophony.

*Râles* may be heard over the affected side if one see the case before the effusion of serum has taken place. After the two layers of the pleura are separated by the effusion it is only rarely that one hears râles below the level of the fluid. The important exception must, however, be noted that fine râles may be heard below the level of the fluid. This is not the place to speculate as to the explanation of this phenomenon, but it must be borne in mind that râles may be heard below the level of the fluid, or else the error of excluding pleurisy with effusion will inevitably be made.

Râles may, of course, be heard above the level of the fluid if there be fibrin on the pleura, or bands of adhesions at that point.

If the fluid be shut in by adhesions (sacculated), we get irregular physical signs, dullness or flatness, changes in the breathing and voice, and râles, corresponding to the situation of the fluid and the compression of the lung. In many cases there may be doubt as to the presence of fluid in the pleural cavity, and this applies to fluid free in the pleural cavity as well as to sacculated pleurisy. Here the diagnosis may be made by the introduction of an exploring needle attached to a hypodermic syringe. This little procedure is attended with such slight risk to the patient that its use is to be recommended in all cases of uncertainty of diagnosis. It must be remembered that a "dry tap" does not exclude the presence of fluid, which may be shut into numerous compartments by adhesions, and therefore introductions of the needle at several different points may be required before the fluid is found. Cases of sudden death have followed exploratory puncture, but fortunately these cases are rare.

As recovery takes place and the fluid is absorbed, the breathing and voice can be heard more and more distinctly, and lower and lower down, until recovery is complete. The flatness changes slowly into marked dullness, and this dullness persists for some time after all the fluid is removed. When there is doubt as to the exact height

of the fluid which remains, the point at which the voice becomes distinctly muffled is the most reliable test.

The *treatment* of pleurisy with effusion is a matter of great importance both as regards the duration of the illness and as affecting the future of the patient. Personally I believe that there should be but one recognized form of treatment, and that is the mechanical removal of the fluid by aspiration of the chest, and that the sooner the fluid is removed the shorter the duration of the disease and the less the risk of the formation of permanent pleuritic adhesions. Aspiration, which was first advocated by Bowditch and Wynan many years ago, is now extensively adopted by physicians, but many still adhere to the practice of depending upon the lymphatics for the removal of the exudate, and wait two or more weeks before resorting to aspiration. There are many who seek to restrain the exudation by the use of the dry diet, and who give sodium chloride in considerable doses. If the effusion be at all considerable it has been an almost universal custom to administer diuretics, even though aspiration were resorted to quite early. After aspiration the use of diuretics is really unnecessary, and its use before aspiration is of doubtful value.

The method I would advocate is that in the cases with high temperature and other symptoms of acute and severe invasion the patient be put to bed and on a fluid diet. His restlessness should be quieted by the use of some of the coal-tar antipyretics; and if the pain in the chest be severe, relief may be obtained by the application of poultices to the chest, or by the administration of morphine. After two or three days of this treatment, if the fluid has accumulated it should be removed at once by aspiration. The temperature usually falls on the day following aspiration, and the acute symptoms subside also, and in a few days the patient feels well enough to sit up. In the cases of insidious and of subacute invasion the removal of the fluid seems to be all the treatment necessary. The patient may be put on a normal diet at once, and may be gotten out of bed as soon as the fluid is removed. Before aspiration the skin of the chest should be disinfected, just as for a major surgical operation, and the aspirating needle and the operator's hands also rendered aseptic. With these precautions purulent infection of the pleura does not ensue.

The amount of fluid removed at one sitting varies. If the amount be not very great, it may be all removed at once; but if the chest be entirely filled, it is not safe to remove it all till the following day. In ordinary cases it is a good rule to remove all one can get, but to stop if the patient feels faint or if he begins to cough. If a little fluid be left it will usually take care of itself. In cases in which the fluid re-accumulates two or more aspirations may be required to effect a cure. The subacute cases in which removal of the fluid is not attended by a fall of temperature are apt to prove to be tuberculous. Sudden death has followed aspiration of the chest, but this is a very rare accident. It must be also borne in mind that when a chest is completely filled with fluid sudden death may occur if aspiration is delayed, and that it is imperative to remove a portion of the fluid as soon as possible.

The *differential diagnosis* of pleurisy with effusion must be made from empyema, pneumonia, pleurisy with excessive production of fibrin, pericarditis, abscess of the liver, or other enlargements of the liver, and new growths of the pleura. Of course the question of the fluid in the pleura being an hydrothorax, or of the pleurisy being a part of a tuberculous process in the lung, or of a lobar pneumonia, must also be considered. A due consideration of the associated symptoms will usually lead to a correct diagnosis, but where there is doubt the introduction of the exploring needle is the most important aid to diagnosis. It must also be remembered that the leucocytosis in all cases of inflammation of the pleura, except empyema, is usually moderate in amount, about ten to fourteen thousand per cubic millimetre, but the leucocytosis may be low in pneumonia or high in a pleurisy, so that the blood count is not a certain means of differentiation be-

tween these two diseases. Where there is the slightest element of doubt the importance of the introduction of the exploring needle cannot be too forcibly emphasized. Frequently pus will be found by the exploring needle when the physical signs would suggest consolidated lung or only a thickened pleura.

Among the infants which we see at Bellevue Hospital, many of whom are half starved or badly nourished, it is not so uncommon to find pus in the pleural cavity when the only reason for the introduction of the needle is a febrile condition and a little dullness over one chest.

PLEURISY WITH AN EXCESSIVE PRODUCTION OF FIBRIN is a much more uncommon condition. We find the pleura on one side, both costal and pulmonary, greatly thickened by a deposit of fibrin, which may be even an inch or more in thickness; there may be a little fluid in the pleural cavity or there may be none.

This pleurisy may be seen in connection with an acute articular rheumatism, or with tuberculosis of the lung, or with epidemic influenza, or without known cause.

The *symptoms* are very similar to those of pleurisy with effusion with acute invasion, or to those of lobar pneumonia.

The physical signs are usually diminished or absent vocal fremitus, flatness on percussion, distant bronchial breathing, distant bronchial voice, or, more commonly, agophony, and abundant fine and coarse pleuritic râles. The physical signs may resemble those of a pneumonia or of pleurisy with effusion.

Exploration of the chest shows that little or no fluid is present, and the absence of the rusty sputum, of the high leucocytosis, and of the flushed cheeks, which are so characteristic of pneumonia, may point to the correct diagnosis.

Unless the inflammation is tuberculous the prognosis is good.

The *treatment* is symptomatic only.

EMPHYEMA.—The inflammation usually involves the whole of the pleura on one side of the chest; occasionally it involves a circumscribed portion of the pleura only.

When we examine the pleura we find two different conditions:

- (1) We see that it is coated with fibrin and pus, and that the pleural cavity contains purulent serum. This form is most common in children.
- (2) In other cases we find the conditions as above, and in addition the pleura itself is much changed. It is split up by a great number of new cells, so that it resembles granulation tissue. In old cases the pleura becomes much thickened and may be infiltrated with the salts of lime.

As in pleurisy with effusion the fluid usually accumulates in the lower part of the pleural cavity, or it may be sacculated in any part of the pleural cavity; or it may be sacculated between the lobes (interlobular empyema), and this is said to occur most commonly between the middle and the upper lobe of the right lung. The suppurative process may extend from the pulmonary pleura to the lung, and the pus will then escape at intervals from the bronchi, or the pus may escape through the chest wall, or the pus may travel down and simulate a psoas abscess. In a few cases the inflammatory products and the superficial layers of the pleura become gangrenous. The purulent fluid is either thin and consists of a considerable number of pus cells in an ordinary sero-fibrinous effusion, or it is thicker and contains a large number of pus cells, or it is a thick and creamy fluid, nearly all pus cells. This latter is usually pneumococcus empyema.

The micro-organisms found are either streptococci or pneumococci in the great majority of cases. In 109 cases of empyema examined by Netter, he found the streptococcus alone in 48 cases, the pneumococcus alone in 29 cases, the pneumococcus with streptococcus in 3 cases. Staphylococci were found in 2 cases. Of 12 tuberculous cases the tubercle bacillus was found in 6.

Of 15 cases of fetid effusion saprophytic organisms were found in all.

Netter points out the much greater benignity of the

pneumococcus, and explains by this fact the more frequent recovery of children; for of 28 cases in children the pneumococcus was present alone or with the other two cocci in 15—a ratio of 53 per cent., which is exactly that of the streptococcus in adults.

The micro-organisms of less frequent occurrence are the typhoid bacillus, the colon bacillus, the gonococcus, and the influenza bacillus.

The inflammation may be primary or secondary. If primary it may follow exposure to cold or to heat, or be without discoverable cause, or it may be only a part of a general streptococcus or pneumococcus poisoning.

It may be secondary to an abscess in the wall of the thorax, in the liver, in the abdominal cavity, or in the lung, any of which may rupture into the pleural cavity.

Empyema not uncommonly follows a lobar pneumonia or a grippé pneumonia. It may follow a simple pleurisy with effusion, but it is a question if this does not depend upon the imperfect precautions taken in aspiration. In the primary cases the rational symptoms are the same as those of the first group of pleurisy with effusion, only they are much more severe. The temperature is higher and may be of the pus type; there are chills and sweating and marked prostration. The symptoms may continue acutely and the patient die in a short time, or they may subside and the inflammation pass into a chronic course. When empyema follows a pneumonia it regularly develops as the pneumonia is subsiding, or a few days after defervescence. The temperature rises again and the patient feels ill again. In the secondary cases the larger number pursue a subacute course, with afternoon exacerbations of fever, dyspnoea, cough, and gradual loss of flesh and strength.

Recovery with absorption or with perforation is very rare. But in some patients there is a partial recovery, most of the pus is absorbed, but there is set up an interstitial pneumonia, with more or less bronchitis, which goes on indefinitely.

The physical signs are essentially the same as those of pleurisy with effusion, and subject to the same modifications, the only exception being that sacculations and irregular and indefinite physical signs are more common in empyema. In many cases the diagnosis can be made only by the exploring needle.

The diseases from which differential diagnosis must be made are pleurisy with effusion, pneumonia, abscess of the liver, subphrenic abscess, tuberculosis of the lungs, and malignant endocarditis; the last two being thought of only where the physical signs in the lungs are unsatisfactory.

The duration of empyema, when no operation is performed, may be from a few days to many years, the patients in the latter case finally dying, emaciated and with waxy degeneration of liver, spleen, and kidneys.

The prognosis without operation is bad; with a proper surgical operation it is very good. Recovery is almost the rule.

*Treatment.*—The essential point in the treatment is to remember that we have to do with an abscess, and that we must follow the ordinary surgical rule, viz., to open the abscess and evacuate the pus. This should be done just as soon as the presence of the pus is shown by the exploring needle, and nothing but the removal of the pus should be thought of. No matter how weak the patient may be he will gain by the evacuation of the pus.

The method of procedure varies according as we have to do with children or with adults.

In children aspiration should first be resorted to, and in a majority of cases this will effect a cure. If the temperature does not fall, and the pus reaccumulates, then the chest may be opened and a drainage tube inserted.

In adults it is a waste of time to aspirate. The chest wall should be opened at once, under the strictest antiseptic precautions, and a drainage tube inserted.

There is some difference of opinion as to whether it is better to incise an intercostal space or to remove a portion of one or more ribs. Personally, I prefer to remove a

large piece of one rib, as the indications are twofold: to make an opening large enough to permit of the insertion of the hand and the breaking up of pleuritic adhesions, so as to permit of thorough drainage, and to favor the closure of the abscess cavity by the collapse of the chest wall. It is not necessary to wash out the pleural cavity unless the contents be fetid. A good-sized drainage tube is inserted, absorbent dressings are applied, and the whole chest is wrapped in bandages. The wound is dressed only when the discharge comes through the dressing. The patient is gotten out of bed as soon as possible, and at the end of a month, at the latest, the drainage tube should be removed. The principal danger after operation is that of reinfection of the pleura, and the success of the operation depends upon the antiseptic precautions taken during the operation and in the subsequent dressings.

If one can be sure that there is only a small sacculated collection of pus, as may be the case in an empyema following pneumonia, aspiration is all that is necessary to effect a cure.

CHRONIC PLEURISY WITH ADHESIONS is a condition which is of interest chiefly because of its resemblance to chronic miliary tuberculosis of the lungs, and of the importance of discriminating between the two diseases.

By chronic pleurisy with adhesions we mean a chronic productive inflammation of the pleura, and not the old adhesions which are found at so many autopsies.

It is an inflammation which is chronic from the beginning and results in the production of new connective tissue only. We find thickenings of the pleura and adhesions between the costal and pulmonary pleurae. One pleura may be involved, or both, or only part of one pleura. The natural tendency is for the inflammation to extend, until finally both lungs are completely adherent to the walls of the chest. There develops more or less inflammation of the larger bronchi, and the heart becomes smaller.

The disease usually originates in the adhesions which have been left by previous attacks of dry or of subacute pleurisy, but sometimes no history of previous pleurisy can be obtained. It may be associated with emphysema or chronic phthisis.

The symptoms are slight or well marked, according to the extent of the lesion. There may be only some pain over the chest and a slight dry cough, or there may be considerable pain, cough with expectoration, dyspnoea, and loss of flesh and strength.

The physical signs depend upon the extent of the lesion. If this be slight there are only a little dulness over the affected chest and pleuritic râles. If the lesion be extensive, we have more marked physical signs. The chest is flattened or retracted, expansion is diminished over the affected area, vocal fremitus is sometimes normal, sometimes increased, and sometimes diminished. The latter is perhaps the most common condition. There is more or less well-marked dulness on percussion; the breathing is diminished, or it may be changed in character, resembling bronchial breathing or broncho-vesicular breathing; the voice is usually diminished, but it may be increased in intensity. Over the affected area are usually heard numerous pleuritic râles, some the creaking sounds of old adhesions, others the crepitant and subcrepitant sounds of more recent adhesions. It must be remembered that if the pleurae are tightly adherent there will be no râles at all. These patients usually die from some intercurrent disease, but occasionally the pleurisy is the only discoverable cause of death.

The treatment is to expand the lungs as much as possible, and to live an outdoor life as much as possible. I am in the habit of advising such a patient to take the deepest possible breaths at each street crossing, and to practise mild chest gymnastics night and morning. The pneumatic cabinet is of service in these cases. Cod-liver oil and general tonics also help.

TUBERCULOUS PLEURISY is usually secondary to tuberculous inflammation elsewhere in the body; most com-

monly, for example, in the lungs, next in the bronchial lymph nodes, then in the peritoneum, bones, etc.; or the tuberculous pleurisy forms simply a part of a general miliary tuberculosis. In some cases, however, no tuberculous focus can be found elsewhere in the body, and these must be regarded as cases of primary tuberculosis of the pleura.

The inflammation regularly involves the whole of the pleura on one side. It may be confined to the costal pleura or may involve also the diaphragmatic or pulmonary pleura.

There may be localized, or widely disseminated, miliary tubercles upon or beneath the pleural surfaces, either in direct association with lesions beneath the pulmonary pleura, or apart from them, or upon the costal pleura.

According to Delafield the gross appearance varies as follows:

1. The pleura is thickened, its surface is bare of fibrin, it is of a bright red color from the congestion of the blood-vessels, and this red surface is mottled with white dots—the miliary tubercles. In the pleural cavity is bloody serum.

2. The pleura is thickened, it is thickly coated with fibrin, no tubercles are visible to the naked eye; the pleural cavity contains clear serum.

3. The pleura is thickened and the pleural cavity contains purulent serum.

In all these cases the changes in the pleura itself are essentially the same—the thickened pleura is infiltrated with new connective-tissue cells. Scattered through its entire thickness are tubercle granula, either singly or joined together by diffuse tubercle tissue. The smaller blood-vessels show a growth of their endothelial cells.

In the serum of tuberculous pleurisy the tubercle bacillus may be occasionally demonstrated by staining, especially if the centrifugal machine is used, but it requires long and careful search, and often all one's efforts are unrewarded. The tubercle bacillus may be associated with other bacteria, most often with the staphylococcus pyogenes in the purulent exudate.

Many cases of pleurisy with sero-fibrinous exudate, giving no growth of bacteria on the ordinary culture media, are found to be tuberculous by the inoculation of guinea-pigs with the fluid.

The symptoms and physical signs are the same as those of pleurisy with effusion, or of empyema, or of pleurisy with an excessive production of fibrin. Of course the only positive diagnosis lies in the finding of the tubercle bacilli in fluid withdrawn from the pleura, but this is a procedure which is rarely successful. A fairly positive diagnosis can, however, be made in a majority of the cases by the consideration of associated conditions. Thus a bloody serum is more likely to indicate tuberculous pleurisy than anything else. A "silent pleurisy" is very apt to prove to be tuberculous. When the temperature remains high after the serum has been removed, and when the serum reaccumulates rapidly after each aspiration, the case is usually tuberculous. When the family history and the patient's history point to tuberculosis, the diagnosis can usually be correctly made. When there is empyema and the opening of the chest is followed by little or no improvement, the case is usually tuberculous. When the empyema is sterile it is usually tuberculous.

The treatment is unsatisfactory. We remove the fluid or we open the chest for the empyema; and then, if the diagnosis is certain and the patients are well enough, we treat them as we would any case of tuberculosis by out-of-door life, change of air, creosote and cod-liver oil, and good food.

CANCEROUS PLEURISY is rare; it may be primary or secondary. Fibroma, sarcoma, and endothelioma may occur as primary tumors of the pleura. Fibroma and lipoma formed in the subpleural tissue may encroach upon the pleural cavity.

Endothelioma usually occurs in the form of larger or smaller, flat or projecting, irregular nodular masses frequently most marked and extensive upon the costal pleu-

ra. Carcinoma may invade the pleura by extension, or sarcoma or carcinoma may be secondary to distant growths of the same nature. Small white, slightly projecting, often pigmented elevations of the pleura, either single or multiple, are common. These were formerly regarded as mostly miliary fibromata, but Hordenpyl has shown that they are mostly fibrous masses which replace or enclose miliary tubercles.

The tumors may be associated with an exudative pleuritis, and with either primary or secondary cancer of the pleura the exudate is frequently bloody. It must be remembered that though bloody fluid suggests either tuberculous pleurisy or cancerous pleurisy, and is due to one of these causes in the great majority of cases, it is possible to have a hemorrhagic pleurisy from other causes:

1. A perfectly simple pleurisy may be hemorrhagic.
2. A bloody fluid is met with in the pleurisy of the asthenic states, such as cancer, nephritis, and cirrhosis, in the malignant fevers, and in severe infections.
3. There may be a hamothorax due to the rupture of an aneurism, or to the pressure of a tumor on the thoracic veins.

4. The chest wall or the lung may be wounded by the aspirating needle, and blood in this way may get mixed with the sero-fibrinous exudate.

5. Wounds of the walls of the chest, fractures of the ribs, and blows on the chest may cause hemorrhagic pleurisy.

The symptoms of a cancerous pleurisy are those of the original new growth plus the signs of a pleuritis. If it be a primary new growth of the pleura, the diagnosis may present very great difficulties.

The subject of TRAUMATIC PLEURISY need not detain us. If there be perforation of the costal or pulmonary pleura there will usually be a sero-fibrinous pleurisy, which may become purulent. Fracture of the ribs or blows upon the chest may cause a dry pleurisy or a sero-fibrinous pleurisy.

PNEUMOTHORAX.—By this we mean *air in the pleural cavity*, and also pyopneumothorax, *air and pus in the pleural cavity*, and hydropneumothorax, *air and serum in the pleural cavity*.

Air alone in the pleural cavity, a pure pneumothorax, is an extremely rare condition, for a pneumothorax usually becomes a pyopneumothorax, or, more rarely, an hydropneumothorax. We, therefore, speak of these three conditions under the term pneumothorax.

Pneumothorax occurs chiefly in adults, although we see it occasionally in very young children. It is more frequently met with in males than in females, and most commonly on the left side. It is caused by anything that perforates the pleura and allows air to enter the pleural cavity; but in ninety per cent. of the cases this cause is the rupture into the pleural cavity of a softened tuberculous nodule, or of a tuberculous cavity.

Other causes are: Perforating wounds of the chest; perforation of the diaphragmatic pleura from malignant disease of the stomach or colon, or ulcer of the stomach; perforation of the pleura by cancer of the cesophagus; perforation of the pleura, in the normal lung, from rupture of the air vesicles during straining; septic bronchopneumonia; gangrene of the lung; abscess of the lung; perforation of the lung from the pleural cavity by an empyema; the development, in a pleural exudate, of the gas bacillus (*B. aerogenes capsulatus*).

Osler has seen pneumothorax caused by the rupture into the pleura of an hemorrhagic infarct in chronic heart disease.

Pneumothorax has occasionally followed the introduction of an exploring needle into the lung. The number of cases of pneumothorax due to these exceptional causes is so small that practically pneumothorax is regarded as of tuberculous origin until it is proved that it is not.

*Pathology.*—If it be a pure pneumothorax we find the air in one of the pleural cavities under considerable pressure. The lung is compressed against the vertebral

column, and it may be small, dense, and unstratified. If there be old pleuritic adhesions the lung may not be compressed against the vertebral column, but irregularly compressed, being held against the chest wall by the adhesions. The mediastinum and the pericardium are displaced, being drawn over to the opposite side, and the liver or spleen may be displaced downward. If there be a pyopneumothorax, or an hydropneumothorax, there is in addition fluid in the pleural cavity, purulent or serous, and the pleura is inflamed.

**Symptoms.**—In the tuberculous cases we have first the ordinary history of tuberculosis of the lungs, then during some severe muscular exertion, or during a paroxysm of coughing, the rupture of the pleura suddenly takes place and the patient experiences a severe pain in the chest accompanied by intense dyspnoea and a feeling of weakness or faintness. He may even become completely unconscious, and he may die without recovering consciousness. If he does not die at once he rallies from the shock caused by the rupture of the lung, but he is much sicker than he was before. He has constant and very severe dyspnoea, and he is usually confined to his bed. He may remain in this condition for two or three weeks and then die, either with or without, though more commonly with, the development of pyopneumothorax, or he may grow stronger and be able to get out of bed and go about a little, but if pyopneumothorax has not already developed it usually supervenes. Then the symptoms of pyopneumothorax are developed, which are, of course, simply an intensification of the symptoms of tuberculosis of the lung with mixed infection. The patient loses flesh rapidly, he has a high fever at night, he sweats profusely, and he may expectorate a great deal of foul-smelling material—the pus from the pleural cavity. He finally dies of exhaustion. It must be remembered, however, that there may be no urgent symptoms of pneumothorax in cases of long-standing tuberculosis of the lungs. There has been found post mortem a pneumothorax which was unsuspected during life. West states that even in healthy adults this latent pneumothorax may occasionally occur.

The **diagnosis** of pneumothorax is usually made with ease by the physical signs. The rule is that the affected side is larger than the other, and it moves but little with respiration. The heart is displaced, and the liver or spleen, or both, may be displaced downward. The vocal fremitus is usually absent.

Percussion gives tympanitic resonance or exaggerated resonance, or amphoric resonance. Auscultation gives amphoric breathing or absence of breathing. Auscultation of the voice gives amphoric whisper or very feeble voice.

If the lung be adherent to the chest wall, there may be pleuritic adhesion râles. There may be the metallic tinkle, even though no fluid be present.

The coin sound, Trousseau's "bruit d'airain," is characteristic. To obtain this sound the auscultator should put one ear on the back of the chest while an assistant taps one coin on another placed on the front of the chest. The metallic-echoing sound which is produced in this way is one of the most constant and characteristic signs of pneumothorax.

Certain exceptions to these physical signs must be noted:

1. There may be but little displacement of the viscera.
2. Vocal fremitus may persist.
3. Percussion may give nearly normal resonance, or flatness, or dullness, signs which may very well deceive us greatly.

4. The breathing may be normal over most of the chest, or it may be bronchial.

The physical signs of pyopneumothorax or hydropneumothorax are usually those of pneumothorax above the level of the fluid, and of pleurisy with effusion below the level of the fluid, to which is added the characteristic sign of air and fluid in the pleural cavity, viz., the *Hippocratic succussion*. This sign is obtained by placing the auscultator's ear upon the chest, and then shaking

the patient's body. A splashing sound is produced which may be audible even at a distance. The patient can often feel and hear this fluid splashing in his chest.

Pneumothorax must be differentiated from large phthisical cavities; from total excavation of one lung; from diaphragmatic hernia following a crush or other accident; from pleurisy with effusion. In most cases the differential diagnosis does not present serious difficulties. The total excavation of one lung in which only a thin shred of lung tissue remains attached to the chest wall presents the physical condition which exactly resembles a pneumothorax and therefore presents unusual difficulties in diagnosis. This is, however, a very rare condition, and the patient does not develop a pyopneumothorax.

The **prognosis** is usually bad. According to West, the mortality is seventy per cent. The tuberculous cases usually end fatally within a few weeks. According to West, of thirty-nine patients, twenty-nine died within a fortnight, ten died on the first day, and two of these within twenty and thirty minutes, respectively, of the attack.

Pneumothorax developing in a healthy individual, it is said, often ends in recovery. There are tuberculous cases in which the pneumothorax, if occurring early, seems to arrest the progress of the tuberculosis.

The question of **treatment** is a difficult one to decide. As a rule, little can be done for the unfortunate victim. An operation for empyema does little good, since we have in the advanced tuberculosis of the lung the main cause of the inflammation of the pleura. In cases which develop early the fluid may, of course, be removed by aspiration, if serous, or a rib may be excised and permanent drainage obtained if the fluid be purulent. If the patient suffers from dyspnoea due to the pressure of the air, this may be relieved by the insertion of a fine trocar and allowing the air to escape. The aspirator should not be used.

Frank W. Jackson.

**PLEURISY ROOT.**—*Asclepias* (U. S. P.). *Butterfly Weed*. "The root of *Asclepias tuberosa* L. (fam. *Asclepiadaceae*)" (U. S. P.).

*Asclepias L.* is a genus of some sixty species, occurring chiefly in North America, a few in Central and South America, and in the tropics of the Old World. A number of these have been found to possess the composition and properties of the official one, and it is probable that the same properties are general in the genus.

The species in question is very abundant in sandy soil from New England southward and southwestward. It is a perennial, hairy herb, sending up a cluster of erect or ascending stems a foot or two long, as thick as a goose-quill, densely leafy, and bearing at the summit several branches terminating in handsome large umbels of orange-colored flowers. It is the only species of the northeastern United States with orange-colored flowers. The commercial root is irregularly or interruptedly fusiform, 10-20 cm. (4-8 in.) long, 1-5 cm. (1/2-2 in.), rarely more, in thickness, usually cut transversely or longitudinally into irregular pieces; externally light orange-brown, becoming gray on keeping, coarsely annular at the crown, bearing numerous fine longitudinal and transverse furrows, imparting a finely tuberculate appearance and feeling; fracture tough, uneven, granular, whitish, the thin bark yellowish in the outer layer, the wood bundles pale yellow; almost inodorous, taste bitterish, slightly acrid and nauseous.

Besides two resins, gum, and a large amount of starch, pleurisy root contains the bitter glucoside asclepiadin, to which its properties are chiefly due. Asclepiadin is a yellow amorphous substance, soluble in alcohol, ether, and hot water, becoming of a deeper yellow, then green, with concentrated sulphuric acid.

Pleurisy root is diaphoretic and expectorant, and in domestic and country practice it has been used extensively in lung affections and catarrh of the air passages. In large doses it is emetic-cathartic. If desired, it can be given in decoction. Dose from 1-3 gm. (gr. xv. to xlv.). The fluid extract is official. *Henry H. Rusby.*

**PLOMBIÈRES.**—Plombières has been called, not without reason, "the Queen of Watering-places of the Vosges." It is charmingly situated, and its surroundings are so attractive that it is a favorite summer resort with many who have not been ordered there for a course of the waters. The little town has only about two thousand inhabitants. It is situated in a narrow valley, with mountains rising steeply up on either side. The climate is invigorating, and, while the days in summer are often hot, the nights are invariably cool.

**ANALYSIS.**—One thousand parts of the water contain in parts:

	Source Vauquelin.	Source No. 1, Du Thalweg.	Source Des Dames.	Source Du Crucifix.	Source No. 5, Savonneuse.
Temperature	158° F.	137° F.	124° F.	115° F.	68° F.
Carbonic acid (free)	0.00638	0.00879	0.1287	0.00825	0.00309
Silicic acid	.02155	.07331	.07311	.00739	.04589
Sulphate of soda	.13564	.07334	.09274	.10070	.04685
Sulphate of ammonia	traces.	traces.	traces.	traces.	traces.
Arsenate of soda	traces.	traces.	traces.	traces.	traces.
Silicate of soda	.12862	.07343	.05788	.10611	.04209
Silicate of lithia	traces.	traces.	traces.	traces.	traces.
Silicate of alumina	traces.	traces.	traces.	traces.	traces.
Bicarbonate of soda	.02288	.01426	.01133	.02062	.00818
Bicarbonate of potash	.01673	.01225	.00133	.00234	.04451
Bicarbonate of lime	.02778	.04965	.02868	.06639	.04551
Bicarbonate of magnesia	traces.	traces.	.00670	traces.	.01253
Chloride of sodium	.01044	.00734	.00927	.01005	.00651
Fluoride of calcium	traces.	traces.	traces.	traces.	traces.
Oxide of iron and manganese	traces.	traces.	traces.	traces.	traces.
Organic and azotized products	indications.	indications.	indications.	indications.	indications.
Total	0.37053	0.62295	0.25821	0.29823	0.19065

A special feature at Plombières is the long time (from half an hour to an hour and a half) during which patients remain in the water. Mr. Wolf ("The Watering-Places of the Vosges") says that only four springs out of the twenty-seven which are now in use at Plombières are drunk at all. The first is the chalybeate, which is very mild, and is employed mainly as a table water and as an adjunct to bathing in cases of anemia and chlorosis. Another spring used for drinking, and also for bathing, the "Source Savonneuse," is mildly laxative. Besides these, the "Source des Dames" and the "Source du Crucifix" are employed for what little drinking there is. Apart from the chalybeate and the Savonneuse, the Plombières waters all belong to one category. Dr. Constantin James calls them alkaline; Dr. Bontentuit, "*arséniatées sodiques, sulfatées et silicatées sodiques*"; M. Jaquet, "*bicarbonatées sodiques silicatées*"; and Dr. Macpherson, "indifferent." The latter designation is most in keeping with their slight degree of mineralization.

The same author states that, "in addition to the baths, a very effective remedy in some cases applied at Plombières are the *étuves*, also called *étuves de l'Enfer*. These are hot vapor baths, for which the heat and vapor are supplied by the running springs. There are two such establishments, both of course underground, and both, at their hottest points, very hot indeed. But for people who cannot stand excessive heat, there is the convenient institution of *étuves en boîte*, which are taken in a closed box, with a hole left in the top for the head." Energetic massage is also much employed at this spa; so that the patient's time, what with drinking, bathing, walking, douching, massaging, and dieting, is quite fully occupied. Most of the visitors are women, although it is by no means an exclusively "female watering-place."

The place is rich in mineral springs, but the proportion of solids in the waters is rather insignificant. Over twenty-five springs are used at Plombières, and the water of most of them is collected into a single conduit and conveyed to the different thermal establishments. Only three of the latter are perfectly modern and satisfactory, viz., the *Nouveaux Thermes*, the *Bain Romain*, and the *Bain*

*Stanislas*. Although so slightly mineralized, the varying temperature of the baths (65° to 160° F.) admits of a certain amount of variety in treatment. The waters are easily borne when taken internally, and do not produce any constitutional disturbance.

A course of Plombières is useful in many nervous states, especially those associated with hyperæsthesia, as well as in those depending upon lithæmia. Many symptomatic neuralgias and parietic conditions derive benefit from a course of treatment at Plombières. Stiff joints may be limbered up, lumbago cured, gouty manifestations alleviated, diseases of women improved. The place also has quite a reputation for the cure of sterility, though on what grounds does not specifically appear. The waters are also applicable to cases of gastralgia, dyspepsia, catarrhal conditions of the bowels, especially when accompanied by chronic diarrhoea. Some skin diseases, such as eczema and psoriasis, are likewise said to be greatly benefited by these waters. The chalybeate springs are, of course, useful in anemia and chlorosis. In phthisis the place is said to be contraindicated.

Plombières is a decidedly international watering-place, although English and Americans form but a small contingent of the six thousand annual visitors of the spa. With reference to accommodation, Mr. Wolf is authority for the following: "The better hotels and villa-pensions seem intended for people altogether of the better classes. They are good, but dear. Of course, there are less pretentious ones, down to the lowest point of the scale; for the spa is much visited. The following are among the best: The Grands Hôtels, Hôtel de la Paix, Hôtel Stanislas, Villa Moequard, Le Chalet Rose, and Maison Rossignol. There are as many as about a hundred private hotels, many of them with a regular table-d'hôte." Altogether, it is quite true that Plombières should be better known in our country than is now the case, especially as it is more convenient of access than Wildbad Gastein, Teplitz, and the other spas of that order, which Americans are wont to visit.

Edmund C. Wendt.

**PLYMOUTH ROCK MINERAL WELL.**—Wayne County, Michigan. Post-Office.—Plymouth.

Plymouth is a handsome village of about eighteen hundred inhabitants, twenty-three miles west of Detroit, from whence it is reached by both the Flint and Père Marquette and the Grand Rapids and Western railroads. The well is situated in a picturesque spot on the farm of Dr. M. V. B. Saunders. It was bored several years since, and the following analysis was made by Prof. John E. Clark, of Detroit, in 1893:

One United States gallon contains: Sodium chloride, gr. 14.38; sodium sulphate, gr. 0.37; sodium bicarbonate, gr. 5.27; potassium bicarbonate, gr. 1.73; calcium bicarbonate, gr. 5.47; magnesium carbonate, gr. 2.90; alumina and iron carbonate, gr. 1.73; silica, gr. 0.50; organic and volatile matter, gr. 1.29. Total, 33.64 grains. Lithium carbonate and carbonic-acid gas not estimated.

No accommodations have so far been prepared for visitors, but the water is widely sold. It is a good example of the alkaline saline carbonated variety of water, and is useful in conditions to which this class is applicable. Its best effects have been observed in disordered states of the stomach, especially when accompanied by hyperacidity. It is also highly recommended in irritable states of the bladder and kidneys as a diuretic and diluent of the urine. It is said to have produced excellent results in gout, rheumatism, gravel, and other affections.

James K. Crook.

**PNEUMATIC CABINET, THE.**—The pneumatic cabinet, as distinguished from the pneumatic chamber of European countries, is an air-tight box of sufficient size to contain only a single patient.

By means of an attached bellows the contained air may be rarefied or compressed, and by means of a tube and stopcock in one wall of the cabinet the patient's lungs may be instantly connected with, or cut off from, the out-