sies, and occurred in only eleven of the two thousand Munich cases. The anatomical lesion upon which the aphasia—seen not infrequently in children—depends, is not known. Possibly, as Leyden states, it may be due to slight encephalitis. Parenchymatous changes have been met with in the peripheral nerves, and appear to be not very uncommon, even when there have been no symptoms of neuritis.

The voluntary muscles show, in certain instances, the peculiar changes described by Zenker which occur in all long-standing febrile affections and are not peculiar to typhoid fever. The muscle substance within the sarcolemma undergoes either a granular degeneration or a hyaline transformation. The abdominal muscles, the adductors of the thighs, and the pectorals are most commonly involved.

Symptoms.—In a disease so complex as typhoid fever it will be well first to give a general description and then to study more fully the sypmtoms, complications, and sequelæ according to the individual organs.

General Description.—The period of incubation lasts from a week to ten days, during which there are feelings of lassitude and inaptitude for work. The onset is rarely abrupt. There may be prodromal symptoms, either a rigor, which is rare, or chilly feelings, headache, nausea, loss of appetite, pains in the back and legs, and nose-bleeding. These symptoms increase in severity and the patient at last takes to his bed. From this event, in a majority of cases, the definite onset of the disease may be dated. During the *first week* there is, in some cases (but by no means in all, as has long been taught), a steady rise in the fever, the evening record rising a degree or a degree and a half higher each day, reaching 103° or 104°. The pulse is rapid, from 100 to 110, full in volume, but of low tension and often dicrotic; the tongue is coated and white; the abdomen is slightly distended and tender. Unless the fever is high there is no delirium, but the patient complains of headache, and there is mental confusion and wandering at night. The bowels may be constipated, or there may be two or three loose movements daily. Toward the end of the week the spleen becomes enlarged and the rash appears in the form of rose-colored spots, seen first on the skin of the abdomen. Cough and bronchitic symptoms are not uncommon at the outset.

In the *second week*, in cases of moderate severity, the symptoms become aggravated; the fever remains high and the morning remission is slight. The pulse is rapid and has lost its dicrotic character. There is no longer headache, but there is mental torpor and dulness. The face looks heavy; the lips are dry; the tongue, in severe cases, becomes dry also. The abdominal symptoms are more marked—diarrhœa, tympanites, and tenderness. Death may occur during this week, with pronounced nervous symptoms, or, toward the end of it, from hæmorrhage or perforation. In mild cases the fever declines, and by the fourteenth day may be normal.

In the *third week*, in cases of moderate severity, the pulse ranges from

110 to 130; the temperature now shows marked morning remissions, and there is a gradual decline in the fever. The loss of flesh is now more noticeable, and the weakness is pronounced. The diarrhœa and meteorism may persist. Unfavorable symptoms at this stage are the pulmonary complications, increasing feebleness of the heart, and pronounced delirium with muscular tremor. Special dangers are perforation and hæmorrhage.

With the *fourth week*, in a majority of instances, convalescence begins. The temperature gradually reaches the normal point, the diarrhœa stops, the tongue cleans, and the desire for food returns. In severe cases the fourth week may present an aggravated picture of the third; the patient grows weaker, the pulse is more rapid and feeble, the tongue dry, and the abdomen distended. He lies in a condition of profound stupor, with low muttering delirium and subsultus tendinum, and passes the fæces and urine involuntarily. Heart-failure and secondary complications are the chief dangers of this period.

In the *fifth and sixth weeks* protracted cases may still show irregular fever, and convalescence may not set in until after the fortieth day. In this period we meet with relapses in the milder forms or slight recrudescence of the fever. At this time, too, occur many of the complications and sequelæ.

Special Features and Symptoms.—*Mode of Onset.*—As a rule, the symptoms develop insidiously, and the patient is unable to fix definitely the time at which he began to feel ill. The following are the most important deviations from this common course:

(*a*) *Onset with Pronounced Nervous Manifestations.*—Headache, of a severe and intractable nature, is by no means an infrequent initial symptom. Again, a severe facial neuralgia may for a few days put the practitioner off his guard. In cases in which the patients have kept about and, as they say, fought the disease, the very first manifestations may be pronounced delirium. Such patients may even leave home and wander about for days. In rare cases the disease sets in with the most intense cerebro-spinal symptoms, simulating meningitis—severe headache, photophobia, retraction of the head, twitching of the muscles, and even convulsions. Occasionally drowsiness, stupor, and signs of basilar meningitis may exist for ten days or more before the characteristic symptoms develop; occasionally the onset is with mania.

(*b*) *With Pronounced Pulmonary Symptoms.*—The initial bronchial catarrh may be of great severity and disguise the other features of the disease. More striking still are those cases in which the disease sets in with a single chill, with pain in the side and all the characteristic features of lobar pneumonia.

(*c*) *With Intense Gastro-intestinal Symptoms.*—The vomiting may be incessant and uncontrollable. Occasionally there are cases with such intense vomiting and diarrhœa that a suspicion of poisoning may be aroused.

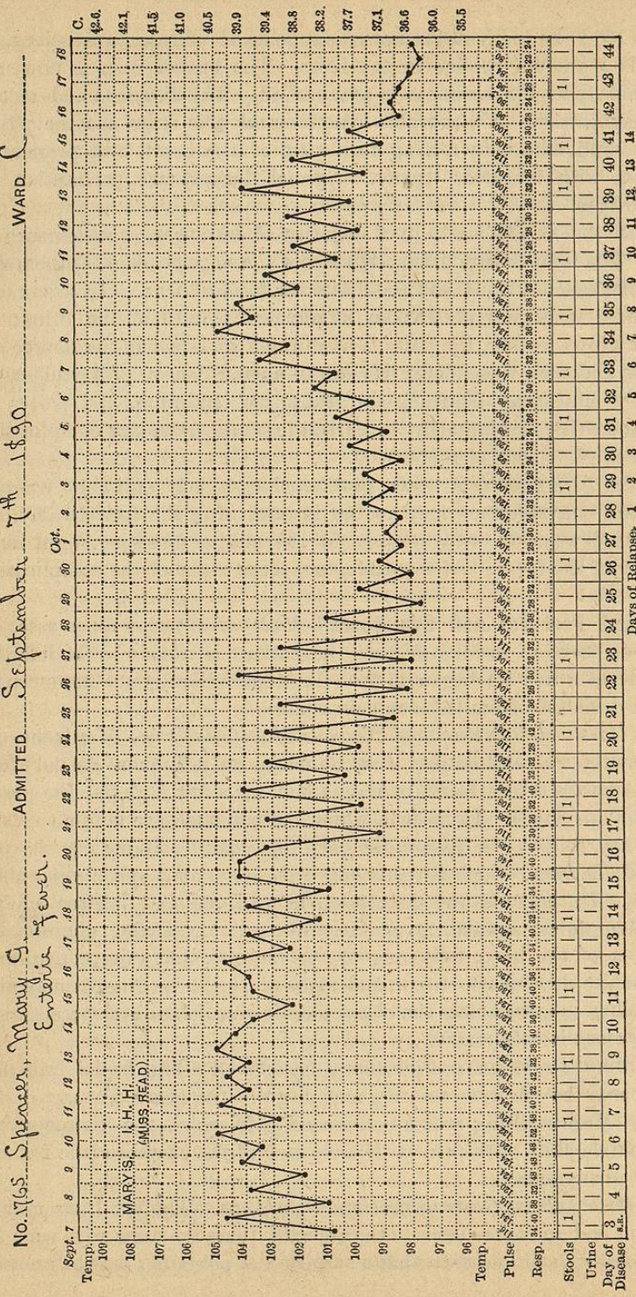

Chart I.—Typhoid Fever with relapse.

(*d*) *With Symptoms of an Acute Nephritis.*—Smoky or bloody urine, with much albumen and tube-casts.

(*e*) *Ambulatory Form.*—Deserving of especial mention are those cases of typhoid fever in which the patient keeps about and attempts to do work, or perhaps takes a long journey to his home. He may come under observation for the first time with a temperature of 104° or 105°, and the rash well out. Such cases seem always to run a more severe course than others, and in general hospitals they contribute largely to the total mortality. Finally, there are rare instances in which the first symptoms are perforation, or a profuse hæmorrhage from the bowels.

Facial Aspect.—Early in the disease the cheeks are flushed and the eyes bright. Toward the end of the first week the expression becomes more listless, and when the disease is well established the expression is dull and heavy.

Fever.—(*a*) *Regular Course.* (Chart I.)—In the stage of invasion the temperature may rise steadily during the first five or six days. The evening temperature is about a degree or a degree and a half higher than the morning remission, so that a temperature of 104° or 105° is not uncommon by the end of the first week. Having reached the fastigium or height, the fever then persists with slight morning remissions. The temperature curve follows the normal diurnal variations, the maximum occurring between four and eight o'clock in the evening and the minimum between four and eight in the morning. At the end of the second and throughout the third week the temperature becomes more distinctly remittent. The difference between the morning and evening may be three or four degrees, and the morning temperature may even be normal. It falls by gradual lysis, and the temperature is not considered normal until the evening record is at 98·2°.

(*b*) Variations in the normal temperature curve are common. We do not always see the gradual step-like ascent in the early stage; the cases do not often come under observation at this time. When the disease sets in with a chill, the temperature may rise at once to 103° or 104°. In many cases defervescence occurs at the end of the second week and the temperature may fall rapidly, reaching the normal within twelve or twenty hours. An inverse type of temperature, high in the morning and low in the evening, is occasionally seen but has no especial significance.

Sudden falls in the temperature may occur; thus, as shown in Chart IV, a drop of 10° may follow an intestinal hæmorrhage, and the fall may be very apparent even before the blood has appeared in the stools. Hyperpyrexia, temperature above 106°, is not very common in typhoid fever except just before death, when I have known the thermometer to register 109·5°. (Chart II.)

(*c*) *Post-Typhoid Elevations—Fever of Convalescence.*—During convalescence, after the temperature has been normal, perhaps for five or six days, the fever may rise suddenly to 102° or 103°, and, after per-

sisting for from one to three days or even longer, falls to normal. With this there is no constitutional disturbance, no furring of the tongue, no distention of the abdomen. These so-called recrudescences are by no means uncommon, and are of especial importance, as they cause great anxiety to the practitioner. They are attributed most frequently to errors in diet, constipation, emotions, and excitement of any sort, such as seeing friends.

There are cases in which the temperature declines almost to the normal at the end of the third week, the tongue cleans, and the patient enters

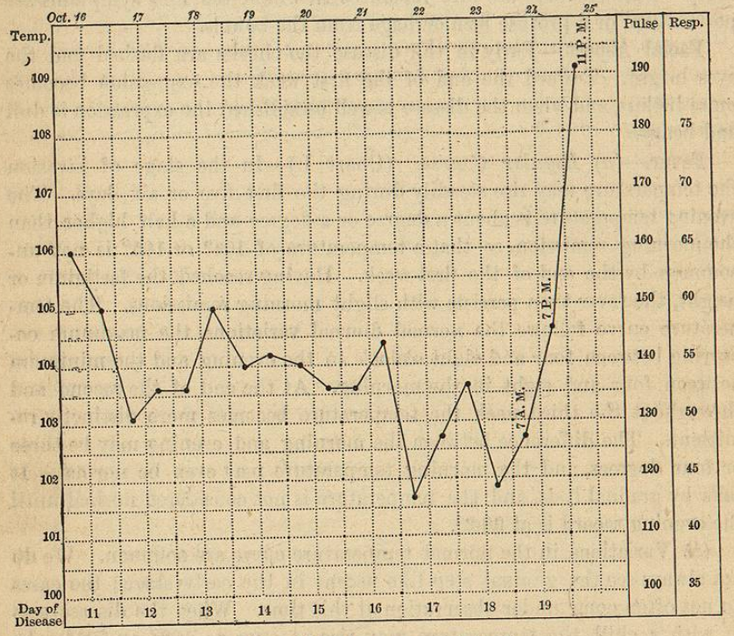

CHART II.—Hyperpyrexia—death.

apparently upon a satisfactory convalescence. The evening temperature, however, does not reach 98·5°, but constantly keeps about 99·5° or 100°, and occasionally rises to 100·5°. This, in the late stages of convalescence, I have seen due to the post-typhoid anæmia. Complications should be carefully looked for, particularly insidious pleurisy or bone lesions.

In certain of these cases the persistence of the fever seems to be really a nervous phenomenon, and there is nothing in the condition of the patient to cause uneasiness except the evening elevation of temperature. If the tongue is clean, the appetite good, and there are no intestinal symptoms, it may be disregarded. I have frequently found this condition best met by allowing the patient to get up and by stopping the use of the thermometer. This prolonged slight elevation of the fever after the dis-

appearance of all the symptoms is most common in children and in patients of marked nervous temperament.

(*d*) *The Fever of the Relapse.*—This is a repetition in many instances of the original fever, a gradual ascent and maintenance for a few days at a certain height and then a gradual decline. It is shorter than the original pyrexia, and rarely continues more than two or three weeks. (Chart I.)

(*e*) *Afebrile Typhoid.*—There are cases described in which the chief features of the disease have been present without the existence of fever. They are extremely rare in this country. No instance of the kind has come under my observation.

Skin.—The rash of typhoid fever is very characteristic. It consists of a number of rose-colored spots, which appear from the seventh to the tenth day, usually first upon the abdomen. The spots are flattened papules, slightly raised, of a rose-red color, disappearing on pressure, and ranging in diameter from two to four millimetres. They can be felt as distinct elevations on the skin. Sometimes each spot is capped by a small vesicle. The spots may be dark in color and occasionally become petechial. After persisting for two or three days they gradually disappear, leaving a brownish stain. They come out in successive crops, but rarely appear after the middle of the third week. They are present in the typical relapse. The rash is most abundant upon the abdomen and lower thoracic zone and often abounds upon the back. It is extremely variable in degree. There are cases in which it spreads to the extremities and often to the face. I can not say that in my experience these cases with the more abundant eruption have been of specially severe type. The rash is not always present. Murchison states that it is frequently absent in children.

A branny desquamation is not rare in cases in which the sudaminal vesicles have been abundant; occasionally the skin may peel in large flakes.

The following accidental rashes are met with in typhoid fever:

1. *Erythema.*—It is not very uncommon in the first week of typhoid fever to find the skin of a vivid red color, almost like a scarlatinal rash. This is particularly noticeable on the abdomen and chest, but the rash may spread to the extremities. It may possibly in some instances, but certainly not always, be due to quinine. I have seen it much more frequently in the past five years (during which time I have rarely ordered a dose of quinine in this disease) than I did in Montreal, where we used quinine largely as an antipyretic.

2. The *tache bleuâtre—Peliomata.*—These are pale-blue spots, subcuticular, from 4 to 10 mm. in diameter, of irregular outline and most abundant about the chest, abdomen, and thighs. They sometimes give a very striking appearance to the skin. It can be readily seen that the injection is in the deeper tissues and not superficial. This rash is quite without significance. Since my attention was called to its association with

body lice, I have met with no instance in which these were not present. Several French observers maintain that they are due to the irritating effects of the fluid secreted by pediculi.

3. Sudaminal and miliary eruptions are common in all cases in which there is profuse sweating.

4. Urticaria is occasionally met with, and lastly herpes, but this is uncommon in comparison with its frequency in malaria and pneumonia.

The *tache cérébrale*, a red line with white borders, can be produced by drawing the nail over the skin. It is a vaso-motor phenomenon which, as in other fevers, can be readily elicited, particularly in nervous subjects. Here may be mentioned certain other cutaneous phenomena also of vaso-motor nature: thus exposure of the abdomen may be sufficient to cause a pinkish injection, which may in places change to an ivory white, giving a curious mottled appearance to the skin. A similar appearance may be seen on the arms. The general tint may be white, with irregular patches or streaks of pink or dark red.

Sweats.—At the height of the fever the skin is usually dry. Profuse sweating is rare, but it is not very uncommon to see the abdomen or chest moist with perspiration, particularly in the reaction which follows the bath. Sweats in some instances constitute a striking feature of the disease. They may occasionally be associated with chilly sensations or actual chills. Jaccoud and others in France have especially described this *sudoral* form of typhoid fever. There may be recurring paroxysms of chill, fever, and sweats (even several in twenty-four hours), and the case may be mistaken for one of intermittent fever. The fever toward the end of the second week and during the third week may be intermittent. The characteristic rash is usually present, and if absent the negative condition of the blood is sufficient to exclude malaria. I have seen cases of this form in Montreal, where there could have been no suspicion of malarial infection.

Œdema of the skin occurs:

1. As the result of vascular obstruction, most commonly of a vein, as in thrombosis of the femoral vein.

2. In connection with nephritis.

3. In association with the anæmia and cachexia.

The hair is very apt to fall out after an attack of typhoid fever. Instances of permanent baldness are of extreme rarity. As in other diseases associated with fever the nutrition of the nails suffers, and during and after convalescence a transverse ridge is seen.

And, lastly, it is stated that a peculiar odor is exhaled from the skin in typhoid fever. Whether due to a cutaneous exhalation or not, there certainly is a very distinctive smell connected with many patients. I have repeatedly had my attention directed to it by nurses. Nathan Smith describes it as of a "semi-cadaverous, musty character."

Circulatory System.—The *blood* presents important changes. The

following statements are based on studies which W. S. Thayer has made in my ward. During the first two weeks there may be little or no change in the blood. Profuse sweats or copious diarrhœa may, as Hayem has shown, cause the corpuscles—as in the collapse stage of cholera—to rise above normal. In the third week a fall usually takes place in corpuscles and hæmoglobin and the number may sink rapidly even to 1,300,000 per c. mm., gradually rising to normal during convalescence. When the patient first gets up, there may be a slight fall in the number of the corpuscles.

The amount of hæmoglobin is always reduced, and usually in a greater relative proportion than the number of red corpuscles, and during recovery the normal color standard is reached at a later period. The number of colorless corpuscles varies little from the normal standard (6,000 ± per c. mm.). As a rule, perhaps the number is slightly subnormal (Pée). This fact is important, and may be at times of real diagnostic value in distinguishing typhoid fever from various septic fevers and acute inflammatory processes in which there is leucocytosis.

The accompanying blood-chart shows these changes well.

The post-typhoid anæmia may reach an extreme grade. In one of my cases the blood-corpuscles sank to 1,300,000 per cubic mm. and the hæmoglobin to about twenty per cent. These severe grades of anæmia are not common in my experience. In the Munich statistics there were fifty-four cases with general and extreme anæmia.

Of changes in the blood plasma very little is known.

The *pulse* in typhoid fever presents no special characters. It is increased in rapidity in proportion to the height of the fever. As a rule, in the first week it is above 100, full in volume and often dicrotic. There is no acute disease with which, in the early stage, a dicrotic pulse is so frequently associated. Even with high fever the pulse may not be greatly accelerated. As the disease progresses the pulse becomes more rapid, feebler, and small. In the extreme prostration of severe cases it may reach 150 or more, and is a mere undulation—the so-called running pulse. The lowered arterial pressure is manifest in the dusky lividity of the skin and coldness of the hands and feet.

During convalescence the pulse gradually returns to normal, and occasionally becomes very slow. After no other acute fever do we so frequently meet with bradycardia. I have counted the pulse as low as thirty, and instances are on record of still fewer beats to the minute.

The *heart-sounds* are at first clear and loud, and free from murmur, but in severe cases, as the prostration develops, the first sound becomes feeble and there is often to be heard, at the apex and along the left sternal margin, a soft systolic murmur. The first sound may be gradually annihilated, as pointed out by Stokes. In the extreme feebleness of the ataxic forms, the first and second sound become very similar and the long pause is much shortened.

Of cardiac complications, *pericarditis* is rare and has been met with chiefly in children and in association with pneumonia. It was not present in any of my cases and occurred in only fourteen of the two thousand

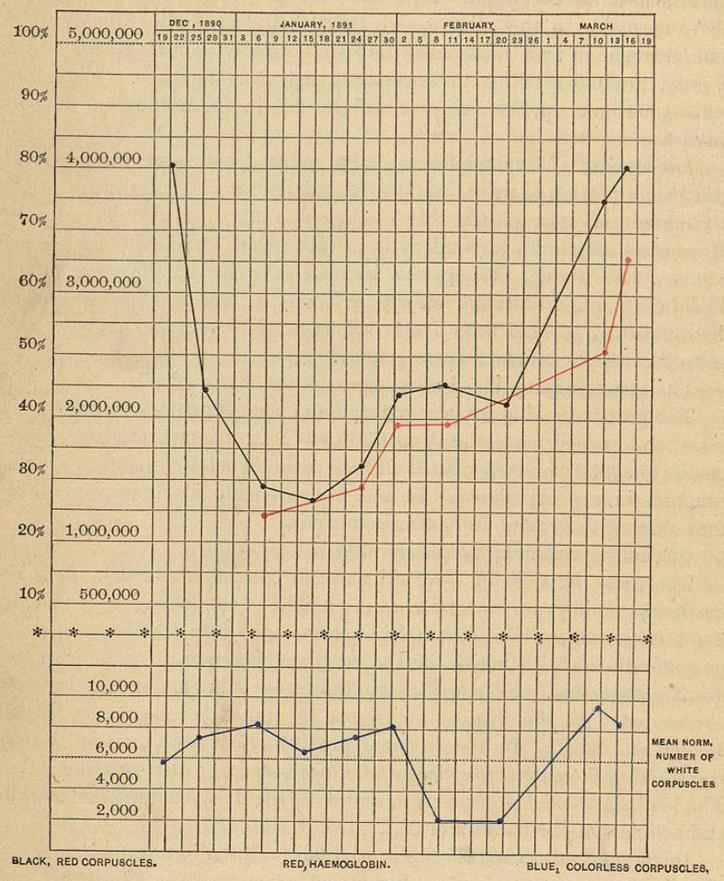

CHART III.

Munich post-mortems. *Endocarditis* is also uncommon. I saw one case at the Philadelphia Hospital. It must be very rare, as there were only eleven cases noted in the Munich records. Myocarditis is more common. The following statement may be made with reference to the condition of the heart-muscle in this disease: In protracted cases the muscle-fibre is usually soft, flabby, and of a pale yellowish-brown color. The softening may be extreme, though rarely of the grade described by Stokes, in which, when held apex up by the vessels, the organ collapsed over the hand,

forming a mushroom-like cap. Microscopically, the fibres may show little or no change, even when the impulse of the heart has been extremely feeble. A granular parenchymatous degeneration is common. Fatty degeneration may be present, particularly in long-standing cases with anæmia. The hyaline change is not common. The segmenting myocarditis, in which the cement substance is softened so that the muscle-cells separate, has also been found, but it is probably a post-mortem change.

Complications in the Arteries.—Obliteration of large or small arterial trunks is one of the rare complications of typhoid fever. A considerable number of cases are scattered through the literature. The obliteration may be due either to embolism or to thrombosis. In a majority of cases the femoral artery is involved and gangrene of the foot and leg occurs. In several cases there has been obliteration of both femorals with extension of the clot into the aorta and gangrene of both legs. In a case which I saw with Roddick, of Montreal, the obliteration of the left femoral occurred on the sixteenth day. On the twentieth day the patient had pain in the right leg and there was no pulsation in the femoral artery. Gangrene gradually developed in both feet, and death took place in the sixth week. In these cases the condition is probably due to thrombosis, not embolism, and is associated with a blood state which favors clotting, or possibly with a local arteritis. The condition is not invariably fatal. Of twenty cases collected by Barchoud,* eight died.

Thrombi in the Veins.—This is a much more frequent complication, and, according to Murchison, is met with in about one per cent of the cases. It occurs most frequently in a crural vein, and more commonly in the left than in the right; due possibly, as suggested by Liebermeister, to the fact that the left common iliac vein is crossed by the right iliac artery, and does not permit of so free a flow of blood as in the right vein. Thrombosis is indicated by enlargement and œdema of the limb, but gangrene never results from obstruction of the vein alone. It is not a very unfavorable complication. In one case of my series the thrombus had suppurated and there was pyæmia. Occasionally the thrombosis may extend into the pelvic veins and into the vena cava. In one instance the thrombus was in the right circumflex iliac vein alone, and the superficial veins on the right side of the abdomen were in consequence greatly enlarged. Sudden death has been caused by dislodgment of a thrombus.

Infarcts in the kidneys, spleen, and lungs are by no means uncommon in typhoid fever. They are associated usually with thrombosis in the arteries, rarely with embolism.

Digestive System.—Loss of appetite is early, and, as a rule, the relish for food is not regained until convalescence. Thirst is constant, and should be fully and freely gratified. Even when the mind becomes benumbed and the patient no longer asks for water, it should be freely given.

* Paris Thesis, 1881.