not exclusively, seem to be its cause." He then enumerates as causes, acute rheumatism, chorea, the exanthemata, typhoid, small-pox, phthisis, septic and pyæmic diseases, and as a favorable condition for its development chronic endocarditis.

Niemeyer⁴ is of much the same opinion. "Whether primary idiopathic endocarditis ever occurs, and whether the disease independently can attack a previously healthy person who has been exposed to cold may be doubted, yet it is not impossible." Niemeyer gives a list of causative diseases which is included in that just given, taken from Strümpel's book.

In addition to the views above expressed, the course of the illness might well lead us to think that its nature differed at different stages. The regular daily remission of symptoms during the first week or ten days, and the regularity of the changes in temperature and pulse-rate on the 17th and 18th of August (the only time in the early part of the illness in which we can exhibit a definite chart), contrast strongly with the irregularity of symptoms and chart of the last week, while the sudden and great increase in the rate of respiration at the end of the second week is suggestive of the time at which a new element was introduced into the case.

What, then, was the disease which *first* attacked our patient?

The clinical aspect of the case was such that the attending physician had no doubt that it was typhoid fever, and the consultants agreed with him in that opinion. The indications pointing to typhoid were the diarrhœa, which, though it lasted but a short time at the beginning of the sickness, reappeared toward the end; the severe afternoon headache; the daily variations of temperature; the enlargement of the spleen; and the absence of symptoms distinctive of any other disease. Yet in view of the facts that the autopsy, made after the disease had been in progress nearly four weeks, discovered no intestinal ulceration, and no evidence of there having been any, and that during the entire course of the disease no rose spots appeared, I believe we are not justified in making that diagnosis, however loath we may be to surrender an opinion confidently held before the patient's death.

Of the other diseases enumerated above as being primary to acute endocarditis, acute rheumatism, chorea, the exanthemata, nephritis, small-pox and phthisis may be dismissed for lack of evidence in their favor. The last of the list is septic and pyæmic diseases. When sepsis or pyæmia is present the place at which the infection entered is usually evident, the womb after child-birth, an open wound after an injury, or some internal lesion, as an intestinal ulcer of typhoid fever. At times, however, the entrance point is obscure, and Strümpel even recognizes cases in which there may have been no lesion, to which he gives the name "spontaneous septico-pyæmia." In the present case there certainly was no *evident* lesion to serve as the starting point of septicæmia. Spontaneous septico-pyæmia is rare, and we must, therefore, have strong evidence in its favor before declaring it, and that we certainly have not here; for a septic disease is usually sudden in its onset, ushered in, and accompanied by chills, has a very irregular temperature chart, and, especially when severe enough to be fatal, and when complicated with endocarditis, presents multiple metastatic abscesses; symptoms which we look for in vain

in the present case. Therefore, that diagnosis, while possible, is not certain nor satisfactory. The numerous extravasations alone are in its favor, but as these did not appear till toward the close of the sickness they throw no light upon its origin.

After thus wandering about in vain search for a diagnosis, we come back to that of which we are certain, acute endocarditis, and ask if that may not account for all the symptoms. Idiopathic inflammation of a serous membrane is not the rule, but with our present limitation of knowledge I believe that we must still admit that it occurs. Endocarditis raises the temperature and increases the rate of pulse and respiration, and gives rise to symptoms which regularly accompany the condition we call fever. This we know from our observation of it when it occurs in the course of some other disease, for example, acute rheumatism. The temperature rarely rises above 103°. There may be subjective symptoms referred to the cardiac region, but often they are absent. A heart murmur usually exists if the valves are affected, but this may not be present, or may be very soft. In the case reported the murmur was supposed to be of hæmic origin.

In general, there are recognized two forms of acute endocarditis, the exudative and ulcerative, the latter usually septic. Ulcers may form because the exudation takes place so rapidly and so abundantly as to cut off the nutrition of the endocardium overlying it; or the exudation may be purulent, and cause abscesses which rupture the endocardium.

May it not be that the case before us began as a non-septic endocarditis resulting in the formation of vegetations; that the process gradually increased in severity (and the process must have been very active, as shown by the profusion of vegetations) until it took on a septic character, which accounts for the irregularity of the chart, the diarrhœa, and the multiple extravasations occurring during the last five or six days? Finally, a large mass was torn from the vegetations, and the consequent plugging of the left common iliac artery was the immediate cause of death.

I offer this explanation as the best I have been able to make of this very interesting and puzzling case, and trust you may suggest improvements on this, or another entirely different that may be more satisfactory. I have to regret that more detailed notes were not recorded during the progress of the case.

New Instruments.

IMPROVED APPARATUS FOR STERILIZING SURGICAL INSTRUMENTS AND DRESSINGS.¹

BY ERNEST W. CUSHING, M.D., BOSTON.

THE inconveniences connected with the methods of sterilizing surgical instruments by immersing them in antiseptic solutions, or by boiling them, have led to the introduction of apparatus for the use of dry heat as a sterilizing agent, the only difficulties to be overcome being the regulation of the temperature, and the even distribution of heat throughout the apparatus.

The oven shown herewith was purchased in Berlin last summer, and may be described as follows: There is a triple metallic box, covered with layers of asbes-

¹ Read at the Meeting of the Surgical Section of the Suffolk District Medical Society, December 3, 1900.

⁴ Text-book of Practical Medicine, vol. 1, p. 329.

tos, and with doors opening on the front. In the free space, C, between the two outer layers, gas mixed with air is burned in a long row of small flames, F. The vapors from the flames pass out by a chimney, S, after circulating around the oven. The draught thus created causes fresh air to pass in at the bottom of the apparatus at R, the air is heated greatly in passing between the two metallic surfaces outside of the cavity of the oven and inside of the chamber where the flame is, K. This hot dry air then enters the oven from above, surrounds whatever may be in it, and passing below K, goes, already hot, to feed the flame before finally escaping. A mercurial regulator, and a thermometer, enable the temperature to be kept at any given point; 150°C ., equal to about 300°F ., is a temperature sufficient in one hour to thoroughly sterilize the contents of the oven, without injuring steel, annealed glass, or dry catgut, cotton, woolen or silk.

It is thus possible to pack in a metallic box nearly everything which it is necessary to use at an operation; such articles may then be sterilized altogether in the box, and the latter need not be opened until the very moment of operation. I show here such a box which I have had constructed for use at laparotomies, fourteen inches long, ten inches wide and two inches high. This contains two trays, in the upper of which are laid all the instruments likely to be wanted, while in the under one are some which may possibly be needed. The abdominal bandage, absorbent cotton, and gauze, for the abdominal dressings, are all laid in the lower tray; there also are needles ready threaded with silk, envelopes containing dry catgut, cut in proper lengths for use; a separate envelope contains fine needles already threaded with silk, and such other things as may be needed in case it be necessary to suture the intestine; three glass drainage-tubes of various lengths complete the outfit.

Of course it would be easy to arrange a box for any other operation, such as a trephining, an amputation, or an operation on bone, and it is easy to see the great amount of labor which is saved by the fact that no instrument is wet or soiled which is not actually used, while the hands of the surgeon are spared the consequences of repeated immersion in carbolic solution, and the injury to the instruments, which is inseparable from boiling, is avoided. The advantages which are claimed for this oven over all previous ones are, first: that sterilization is accomplished simply by a current of hot air; second, that the bottom is not excessively heated, and the temperature throughout the oven is the same; third, that the finest instruments

are not injured in point or edge, and they may be laid anywhere on the shelves in the oven without special protection; fourth, that with consumption of very little gas, the full temperature of 150°C . may be obtained within twenty minutes; lastly, that this apparatus may be used for sterilizing other things besides instruments and dressings. For example: a suit of clothes which has been worn where there is infectious disease, may be folded, laid in the oven, and baked without injury to the fabric.

The other apparatus shown to-night is an improved form of sterilizer where steam is the agent employed. It is extremely convenient for use in a hospital in making preparations for operations, as by this we can rapidly sterilize the clothing, sheets and blankets to be used at an operation, the robe of the operator, the towels which are to be placed around the wound, and wads of absorbent gauze, which take the place of sponges.

In this apparatus a double, cylindrical kettle of copper is enclosed in an iron jacket, so that the heat from a large Bunsen burner passes all around the kettle. A heavy cover, lined with felt, and fastened with three screw clamps, closes the kettle, steam tight; a gauge in front shows the amount of water present; metallic cylinders of different lengths are provided to hold whatever is to be sterilized. These cylinders have closely fitting covers, and two movable bands near the top and the bottom. The bands and cylinders are pierced with holes; by this means when they are in the sterilizer the steam can penetrate throughout the cylinders, and when the latter are taken out the holes are covered by slipping the bands sideways, and thus no germs can enter. The space between the two walls of the kettle is partially filled with hot water, one or more cylinders with their contents are put in, the cover is screwed on, and the lamp lighted. The steam which is generated passes into the inner kettle, through a row of holes near the top and streaming through the cavity, it passes out near the bottom through a lead tube coiled in a vessel of cold water. The articles to be sterilized are thus kept in a current of steam at a temperature of about 214°F ., which can be increased a little by carrying the end of the lead pipe deeper under the water. Very perfect sterilization may be obtained in half an hour by the use of this apparatus. The articles which have been steamed seem hardly damp when taken out, and by using one cylinder for towels, an abundant supply of these, perfectly sterilized, is available at operations. Similarly with the wads or pads of gauze, which take the place of sponges; these may be carried to the scene of operation in the same cylinder in which they are steamed, and used with the greatest confidence in their aseptic condition.

It is well known that dry gauze is a much better hæmostatic than a wet sponge, and by the use of the former and of dry steamed towels a great deal of unnecessary sloppiness is avoided at operation, and the patient is kept dry and clean.

Every surgeon, who has conscientiously prepared his own instruments, and his sponges, for operations, will realize the immense amount of time and labor saved by the use of the apparatus above described, which I shall be pleased to show in action, to those specially interested in the subject, at the Woman's Charity Club Hospital, No. 38 Chester Square, Boston.