seventh in the axilla; but at the back it now reaches the upper border of the ninth rib, and there is partial dulness to the angle of the scapula. The ribs over the hepatic region scarcely move with respiration. The heart's apex is not displaced. The most tender points are still in the epigastrium and in the eighth interspace in the axilla. There is decided tenderness below the twelfth rib behind. There is no appearance of pointing on the surface; in fact, the œdema which was formerly noticed has disappeared. I asked Dr. Ralfe, of the Seamen's Hospital, to see him to-day, as Dr. Murchison was absent from town. Dr. Ralfe, thinking the time indicated by Dr. Murchison for operative interference had arrived, recommended the aspirator to be used to relieve him. The patient rather objected to the operation, and preferred to wait a few days and see how he got on.

22nd.—As the paroxysms of pain had been very severe and frequent, the patient agreed to the operation. As he was rather nervous, he was placed under the influence of ether, and Dr. Ralfe indicated a point in the eighth interspace at the back part of the axilla, three inches and a half below and four inches and a half outside the nipple, for the introduction of the needle. A No. 3 needle was inserted at this point to a depth of two inches and a quarter, and in a somewhat forward direction. About three-quarters of an inch after insertion a feeling was experienced of the needle having entered a cavity. On aspiration, pus immediately made its appearance. At first it was of a chocolate colour, but after six or seven fills of the instrument it assumed a redder tinge. When the pus began to come slowly, slight movement of the point of the needle caused it to come more freely. Ultimately, as the pus came very slowly, and evidently mixed with much blood, the needle was withdrawn. The total quantity of matter drawn off was thirty-nine ounces. It was perfectly free from offensive smell. A broad bandage was applied round the body, and two grains of opium administered.—9 P.M.: Temperature 98.4°; pulse 82; free from pain.

23rd.—10 A.M.: Temperature 97.6°; pulse 92. Slept well; no pain; some tenderness in the old places, but less than before the operation. Dulness has fallen in axilla to the eighth rib, and behind to the ninth interspace. Can draw a breath more freely. Is troubled with flatulent distension of the abdomen. Evening temperature 98.8°.

Sept. 1st.—The pain and tenderness have gradually returned. The last couple of days he has had severe paroxysms of pain. The evening temperature has risen to above 100°, and the night-sweats continue. Dr. Ralfe saw him to-day, and recommended a further operation. It was decided to introduce a trocar, and put a drainage-tube in. The patient thought he could bear the operation without an anæsthetic. A medium-sized trocar, smeared with carbolised oil, was inserted in the eighth interspace, just in front of the former seat of puncture, in a somewhat forward direction. It was inserted to its full extent. The abscess was, however, missed, owing probably to its having receded in position since the evacuation of its contents. Nothing but a few drops of blood escaped. The trocar was withdrawn, and a pad of lint applied to the wound. Three grains of opium were administered. In the evening he was free from pain.

On the following day he was almost free from pain and tenderness, and felt on the whole relieved by the puncture. He could draw a long breath more freely. His abdomen was much distended with flatulence, but was not tender. Evening temperature 101.8°.

5th.—Dr. Ralfe saw him again to-day. The pain having gradually returned, and the evening exacerbations of fever continuing, we decided to aspirate, and then, if it seemed desirable, to introduce a trocar and drainage-tube. Chloroform, followed by ether, was administered. No. 3 needle was again used. It was introduced close to the seat of the first puncture, and in a forward direction. On aspiration no pus came. The needle was partly withdrawn and reintroduced in a backward direction, when it was felt free in a cavity, and pus came. It was of a deep chocolate-brown colour, very thick, and came slowly. When twelve and a half ounces had been drawn off, as the matter came very slowly, the needle was taken out. After standing a little while the matter withdrawn coagulated into a solid clot, the consistence of blood-clot.—10 P.M.: Temperature 97.3°; pulse 80. Is free from pain.

6th.—Had slight pain in the side during the early part of the night. This morning has no pain. Can draw a long breath freely. In front the dulness has fallen to the sixth cartilage. In the axilla there is no absolute dulness whatever, only partial dulness on the eighth rib and eighth space. At the back there is partial dulness on ninth rib, becoming absolute at the lower border of the tenth rib. Suffers a good deal from flatulent distension. Temperature normal morning and evening.

11th.—He is still quite free from pain. Has no night-sweats. Temperature has continued normal. He can draw a long breath, cough, and sneeze without pain. He says he can laugh more freely than he has done for years. Feels in capital spirits; eats heartily. Has begun to take cod-liver oil. From this time he continued to gain flesh and strength. He occasionally had an uneasy feeling in his right side, not amounting to actual pain. The epigastric tenderness has completely disappeared. Very deep pressure in the eighth space in the axilla caused slight pain, but not enough to make him flinch. On October 14th and the two following days he had a little pain in the side, and the evening temperature rose to a little above 99°. It was feared the mischief was returning, but the symptoms passed off, and the temperature resumed its normal condition. His weight on September 16th was 8st. 10lb., on October 2nd 9st. 11lb., on October 30th 9st. 6lb. He says his natural weight is about 9st. 8lb.

At the present date (November 2nd) he seems in perfect health. He says he sometimes feels a little uneasy sensation about the lower part of the right back, but never amounting to actual pain. He can laugh, cough, and draw a deep breath without any of the catching pain which he had felt more or less for the last four years. There is absolutely no tenderness at any part of the liver region. The liver dulness begins on the sixth rib in front, on the eighth in the axilla, and on the eleventh behind. The right lower ribs move freely with respiration. The appearance of the two sides is symmetrical. The breath-sounds are heard over the normal area on the right side. The enlargement of the lymphatic glands, which had been noticed in the axillæ and groins, has subsided. His appetite is good. He suffers much less from dyspepsia and flatulence than he has for a long time. He takes cod-liver oil and three grains of quinine daily.

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ON THE NUMERATION OF BLOOD-CORPUSCLES.

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THE richness or poverty of the blood in corpuscles can only be ascertained by directly counting the number of corpuscles in a given volume of the blood. It is only by this means that variations in their number—an important element in all conditions of anæmia—can be with accuracy ascertained or stated, and it is thus that the relative numbers of the red and white corpuscles can be best determined. The method is not only an important addition to our means of clinical accuracy; it is an extension of our field of observation which will probably lead to important additions to our knowledge of the pathology of the blood. As an illustration, I may mention the recent observations of Meunier on the relation between the number of corpuscles in the blood and the excretion of urea during convalescence from acute diseases.

The method, although it has been largely employed in France, and also in Germany, is almost unknown in clinical work in this country. The only observations which, as far as I am aware, have been published here, are a series on the blood in albuminuria by Dr. Dickinson. One reason for this is, doubtless, that no instruments for the purpose have been made in this country, and that those hitherto made abroad have the inconvenience that they can be employed only with one microscope, and with an eyepiece made specially for the work.

It is perhaps necessary to explain that the principle of

the proceeding is, in all cases, that which was devised a quarter of a century ago by Vierordt, and consists in making a definite dilution of a measured quantity of the blood, and counting the number of corpuscles contained in a certain volume of that dilution. Several modifications of the process have been made, relating especially to the latter part of the process. Vierordt drew uniform lines of the diluted blood along a glass slide, and, after drying, counted the corpuscles in a given extent of those lines. Cramer substituted for this what may be termed a capillary cell, and in the better known methods of Potain and Malassez a capillary tube is employed. Hayem and Nacet have improved upon this by employing a cell of a certain depth. In each case the area of the tube or cell in which the corpuscles are counted is determined by the method devised by Cramer of employing a "quadrilled ocular"—i.e., an eyepiece micrometer, ruled in squares, the value of which for the microscope used is definitely known.

In order to remedy the inconveniences of this method, a modification of Hayem's instrument has been made, according to my directions, by Mr. Hawksley, of 300, Oxford-street, which can be used with any microscope, and by which somewhat greater accuracy can be secured in the operation. In it tenth-of-a-millimetre squares are ruled on the glass slide at the bottom of the cell. When the corpuscles have subsided to the bottom of the cell, they are seen lying in the divisions, and the number in each can be counted with perfect facility. In the French instrument, a little fluid has to be placed in the glass cell to secure the covering-glass. This I have found objectionable, because the amount of fluid influences the closeness with which the covering glass rests on the cell and the consequent depth of the cell. To obviate this source of error, the slide has been placed on a metal slip to which two springs are attached; these rest on the edges of the covering-glass, and keep it in position with a pressure which is always uniform. The other parts of the instrument, for measuring and mixing the blood and the diluting fluid, are on the same plan as in the instrument of Hayem and Nacet. But by employing a dilution (1 in 200) which is somewhat different from that which they employ (1 in 251), the process of ascertaining and also of stating the corpuscular richness of the blood is much simplified.

The hæmacytometer consists of—(1) A small pipette, holding exactly 995 cubic millimetres. (2) A fine capillary tube, holding five cubic millimetres. (3) A small glass jar, in which the dilution is made. (4) The cell, above-mentioned, exactly $\frac{1}{10}$ th of a millimetre deep, the floor of which is ruled in tenth of a millimetre squares. Various diluting solutions have been recommended in order to change as little as possible the aspect of the corpuscles. It is not well, however, to endeavour to observe the characters of the corpuscles during the numeration. Whatever solution is employed the corpuscles are, more or less, changed by it. One which answers very well is a solution of sulphate of soda of a specific gravity of 1025.

The mode of proceeding is extremely simple. A pipetteful of the solution is placed in the mixing vessel. Five cubic millimetres of blood are then drawn into the capillary tube from a drop in the finger, and then blown out into the solution. The two are well mixed by a glass rod; a drop of the dilution is placed in the centre of the cell, the covering-glass applied and secured by the springs, and the slide placed on the stage of the microscope. The lens is then focused to the squares. In a few minutes the corpuscles have sunk on to the squares. The number in ten squares is then counted, and this, multiplied by 10,000, gives the number in a cubic millimetre of blood. The average of healthy blood was decided by Vierordt and Welcker to be 5,000,000 per cubic millimetre, and later results agree with this sufficiently nearly to justify the adoption of this number as the standard, it being remembered that in a healthy adult man the number may be a little higher, in a woman a little lower. The number per cubic millimetre is the common mode of stating the corpuscular richness of the blood. But by employing this dilution, and squares of this size, a much more convenient mode of statement is obtained. Taking five millions as the average per cubic millimetre in healthy blood, the average number in two squares of the cell is 100. The number in two squares (ascertained by counting a larger number, ten or twenty, and taking the mean) thus expresses the percentage proportion of the corpuscles to that of health, or, made into a two-place decimal,

the proportion which the corpuscular richness of the blood examined bears to healthy blood taken as unity, or the number in twenty squares may be taken as a three-place decimal. This is a much more simple process than that of Hayem.

For instance, in a case of lymphadenoma with moderate apparent anæmia, it was found that ten squares contained 355 corpuscles, equal to 3,550,000 per cubic millimetre of blood. The average of two squares (71) is the percentage, and thus the corpuscular richness is 71.

In the proceeding one or two precautions are necessary to ensure accuracy. The blood, as Hayem suggests, should be obtained by a puncture with the point of a lancet, sufficient to permit the escape of a drop without much pressure. If the finger is much squeezed or pressed, the relative amount of serum and corpuscles is affected. It is somewhat difficult to get the exact quantity of blood in the capillary tube, because, in removing the blood from the point, a little is easily drawn out of the tube. It is therefore best to draw rather more than the required quantity into the tube, then to remove the blood from the point with a soft cloth, and keep the cloth in contact with the point while the extra blood is blown out of the tube. A little of the diluting fluid should be drawn into the tube after the blood is ejected, to ensure the removal of all the corpuscles. The drop placed in the cell should not come in contact with the sides of the cell. It must of course be in contact with the cover-glass. The corpuscles should be counted in or near the centre of the drop. In distinguishing the red from the white corpuscles, it must be remembered that a weak diluting solution causes many corpuscles to swell up to twice the size of the others, and care is needed to distinguish these from the white cells. A quarter-inch objective is the most convenient to employ. The whole process, from beginning to end, does not occupy more than a quarter of an hour.

As instances of its use the following may be cited. In a case of anæmia from lead-poisoning the number was found to be only 3,020,000 per cubic millimetre, equal to 60 per cent. (.604 of the normal quantity). In a case of chlorosis the number was only 3,320,000, giving a percentage of 66 (a proportion of .662). In another case of chlorosis the number was only 2,830,000 per cubic millimetre, giving a percentage of 56 (a proportion to health of .56). In a man with great, apparently idiopathic, anæmia the number was as low as 1,650,000, giving a percentage of only 33.

It may be asked—Is a process in which so large a dilution is employed, as is necessarily the case in the numeration of blood-corpuscles, one of sufficient accuracy to render it really useful? A certain amount of error must be admitted, but I think that the following example shows that the accuracy obtainable is sufficient to give reasonable value to the results obtained. I made three careful consecutive observations on the blood of the same individual, taking a fresh drop on each occasion, and taking the average of twenty squares each time. The percentages obtained were respectively 83, 87, and 84, giving a mean of nearly 85, from which the extreme variations were less than 3 per cent. In the case of idiopathic anæmia mentioned above, two separate dilutions gave 1,640,000 and 1,660,000 corpuscles per cubic millimetre, the proportion to normal blood being respectively .328 and .332—a very slight variation. A greater diversity than these would still be less than Sørensen found to be unavoidable with Malassez's instrument.

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CONNEXION OF EXOPHTHALMIC GOITRE WITH MANIA.

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IN THE LANCET of Nov. 17th, a case of mania associated with exophthalmic goitre is reported by Dr. Rhys Williams, of Bethlem Hospital, and the notes of the following case, in many respects similar, though less complete in its history, bears upon the subject. The peculiar irritability and mobility of temper which not unfrequently accompanies this disease has been noticed by Trousseau.¹ He

¹ Lectures on Clinical Medicine.