ration it was resolved to make an exploratory incision, and be guided by circumstances.

26th.—An incision was made, about three inches long, between the umbilicus and pubes, and the peritoneal cavity gradually opened. The tumour now looked very vascular, and had the appearance more of a muscular than of an encysted tumour of the ovary. To make sure, the trocar was plunged in, but nothing flowed except a little blood. This puncture was closed with a silver-wire suture, the ends being cut off close. The wound in the parietes was closed with wire sutures, and the patient placed in bed. A little tympanitis came on soon after, but upon the whole the patient went on well till the 3rd of March, when she had a marked rigor. On the 12th she was seized with severe pains in the knee. The following morning there was acute inflammation of all the tissues of the right eye, and great pain and tenderness in the abdomen. On the 15th there was increase of abdominal pain, and the patient became insensible. In the afternoon a four or five months' foetus came away. The patient sank exhausted on the 17th.

Post-mortem examination.—The wound in the parietes was unhealthy and gaping. About a quart of purulent matter was found in the parietal cavity. The tumour was adherent on both sides to the pelvic fascia and about two square inches of liver; and on being removed from the abdomen, it proved to be about the size of a peck-basket, smooth and regular over the bulk of its surface, but having on one part two small projections, each the size of a fist. On making incisions into the mass, it was found to be of a true fibroid nature. Further examination showed that the growth involved the whole of the left side of the uterus. The foetus had lain upon the right side, and must have occupied a position parallel to the tumour; so that, during life, half the mass would have been tumour and the other half foetus. By cutting through the centre, the two portions might have been separated. The parietes of the part which had contained the foetus were not at all contracted, neither could they well have been. There were some small purulent deposits in the kidneys and liver. I do not think it possible for anyone to have diagnosed this case, except by an exploratory incision.

Ovarian dropsy may be mistaken for ascites, and ascites for ovarian dropsy, if an examination be carelessly conducted. Several cases are recorded, and more are unrecorded, where these errors have been made. But ascites is sometimes mixed with ovarian dropsy, the two diseases running together, and then the diagnosis is much more difficult. One of the cases early received into the Home will clearly illustrate this fact.

CASE 5.—The patient was married, and had four children. She was admitted in 1859. Four years before, a tumour appeared in the right side of the abdomen, which, in spite of all treatment, increased in size. In 1858 she was tapped four times. Before admission she had been a hard drinker, but was urgent to be operated upon. After making an incision, no less than forty-five pints of ascitic fluid were drawn off, a large multilocular ovarian mass being all the time felt in the body. This mass was removed in the usual way, and the operation was then completed. The patient sank, on the sixth day after the operation, from incessant vomiting, having brought up many quarts of thick green bile. On a post-mortem examination it was found that the liver was very pale, small, and friable, breaking down on the slightest touch; and the kidneys were enlarged and congested. This patient evidently died from her old-diseased liver. It was not a case in which an operation would have been performed if it could have been diagnosed that she had so much ascitic fluid and a diseased liver.

As an example of the fourth condition which I mentioned as simulating ovarian dropsy—viz., encysted tumour—I will mention a case admitted into the Home on Nov. 26th, 1862:—

CASE 6.—A woman aged thirty years; married four years, without issue. Always had good health till six years ago, when she perceived a tumour, which increased between each catamenial period, and decreased during menstruation, when there was a discharge of fluid in considerable quantities per vaginam. The patient's health failing, in March, 1860, she was tapped, and two quarts of dark fluid drawn off. On examination after admission into the Home, a large multilocular ovarian tumour was diagnosed, and also what appeared to be an irreducible umbilical hernia of the omentum. On Dec. 11th, after the primary incision, a large quantity of ascitic fluid escaped. There was then seen a cyst, which looked like intestine. On examination the tumour was found to be composed of several hard masses (like scirrhus) firmly adherent in every direction. It was attached to the whole omentum, liver, and uterus. Being unable to remove the mass, a quart of pale-yellow fluid was drawn off from two of the cysts, and the

wound closed with silver sutures. The patient went on well until the 17th. On the evening of that day she had a sharp fit of coughing, when a quantity of thin serous fluid burst from the centre of the wound. This continued to flow more or less for some days, and then stopped. On the 26th a small abscess opened at the upper part of the wound. On the 28th the tumour began to refill, and there was continual sickness, the wound reopening and gaping. The patient sank, and died on Jan. 6th, 1863.

This case was submitted to the Pathological Society, and there examined by Mr. Nunn and Mr. Holmes. They found the disease arise from the sub-peritoneal covering of the fundus of the uterus. It was composed of fibroid masses, with distinct cysts, having secreting membranes within them. The case is recorded in the "Transactions" of the Society.

EMPHYEMA AND PNEUMOTHORAX.

PARACENTESIS OF NECESSITY.

By G. GODDARD ROGERS, M.D.,

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THE following affords an instance of formidable pleuritic symptoms appearing unusually late after direct violence to the chest wall. The patient was under my father's care, and on two or three occasions I saw him, and gathered a brief history of his case.

J. E—, a somewhat delicate-looking man, fifty-four years of age, complained on the 15th of last April of pain in the left side, about three inches below, and posterior to, the nipple. He stated that six weeks previously, whilst at work in the locomotive department of the London and North-Western Company at Wolverton station, he slipped, and fell heavily on a block of iron, thereby "bruising the bone." He went on with his daily work, but "always felt heavy and sleepy." The ninth rib, a little external to its angle, was found to be the painful spot. During the night of the 15th he was attacked with pain of a much more severe character. The following day he was delirious, and cough and rigors followed in the course of twenty-four hours. I am not able to give any details of the treatment then pursued; but under it all active pleuro-pneumonia vanished, and the patient was left anæmic, rarely suffering from local pain, but with attacks of dyspnoea, chiefly caused by change of posture. During May, June, and July, vast quantities of purulent matter were expectorated, oftentimes as much as a pint without cessation, and I am assured that on one occasion nearly a quart was thus got rid of.

During May there was not much difference between the respiratory movements of the affected and non-affected sides; but the left side was dull on percussion below the inferior angle of the scapula; above this the respiration was feeble; whilst bronchophonic resonance and tubular breathing were well marked anteriorly above the nipple, and to some extent in the infra-axillary region. The symptoms all became more marked during the next five or six weeks, but still no widening or convexity of the intercostal spaces indicated that the secreted fluid was striving to acquire more territory by the displacement of the circulatory organs. With the increased dulness and gradual rising of the fluid, the succussion sound was very audible both in front of and behind the left lung. The copious expectoration went on as before until the 11th and 12th August, when there was but slight cough, and no expectoration, and the patient was able to get up and walk about his house. The middle of the left side felt doughy, and there was slight tenderness and swelling over the fifth and sixth ribs. This increased, and on the 14th September an opening was made just above the sixth rib, and a large quantity of thinnish pus evacuated. Later in the month, and again during October, I saw the man, who was free from cough, able to walk out daily, and to enjoy his meals. There was some oozing from the side, which led one to fear that a permanent fistulous drain would be set up. The left side was somewhat flattened, the measurement between the left nipple and the median line being about half an inch less than on the sound side. I have had no opportunity since of measuring the chest; but I understand the man expands it freely, there being no perceptible difference between the two sides; whilst his capability of resuming laborious work in a huge locomotive factory is the best proof that no permanent injury has accrued to lung or pleura. The entire time of his being laid aside was about seven months

and a half. His appearance is now that of a person in perfect health; he has gained in flesh, and lost his former delicate look.

Having had but a very small share in the treatment of the above case, I wish to express my conviction that the man's perfect recovery is owing in great measure to his medical attendant's careful avoidance of the *nimia cura*. After the first active symptoms were combated, the system was kept up by mineral acids, steel, generous diet, and full allowances of wine; and this plan was pursued without intermission, even though temporary attacks of pyrexia came on. So soon as nature relieved the pleural cavity of its contents by copious expectoration, all hurling of counter irritants, absorbents, and the rest of the pharmaceutical weapons at the side of the unfortunate sufferer was studiously shunned. At length the right time arrived when the costal lamina was spontaneously perforated, and indications arose that the effused liquid was making its way outwards. There were no signs of tubercular disease in the case, and it therein resembles one mentioned by Dr. Watson,* except that nature here disclosed the spot where matter was collecting, and saved any hazardous exploration. Had I not been able at one examination to have assured myself of the presence of air in the pleural sac, I should have been led to account for the constant profuse expectoration in the manner first suggested by Dr. Barlow—viz., that the matter was taken up by the surface of the lung (from a large circumscribed abscess), and discharged into the bronchial tubes without any direct opening.† But being fully satisfied that here at least Dr. Barlow's hypothesis is untenable, I look upon the case as one of traumatic pneumothorax. The violent blow on the side so bruised, even if it did not tear, the lung, that suppuration was eventually set up; the contents of the pneumonic abscess first finding vent by a communication with the bronchi, secondly by communication with the pleural cavity; the subsequent empyema being cured by the so-named paracentesis of necessity; and coincidentally the abscess in the lung cicatrized (?), or at all events ceased to be a cause of annoyance.

George-street, Hanover-square, Jan. 1864.

ON SPIROMETRY.

By H. BEIGEL, M.D., L.R.C.P.L.,

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At the present time, when the physician aspires more and more to become independent of subjective symptoms, and to form an objective diagnosis, I may be permitted to call the attention of physicians to the use of the spirometer in diseases of the lungs as one of the most excellent diagnostic resources in those diseases. During the time of my practising as a physician in a much frequented watering-place, where thousands of sufferers from chest diseases came under my observation, I felt the urgent necessity of finding out a formula by which to measure, at least approximatively, the absolute capacity of the lungs of those in good health, and thus to raise the spirometer to its true worth in the hands of the physician. I venture to communicate the results of my investigations on mensuration and spirometry.

Mensuration.—The mensuration of the thorax in itself does not give any particular information on the proportions of size; but it is, as I intend to show, an essential requisite for spirometry. The question is to find out fixed points for measuring. I have found the following to be the most appropriate for the purpose:—

1. I call the *upper circumference* of the chest that found by measuring directly below the armpit.
2. The *middle circumference* of the chest that gained by measuring at the level of the nipple.
3. The *lower circumference* of the chest at the level of the lower part of the sternum.
4. The *front length* of the chest from the incisura jugularis to the point of the processus ensiformis sterni.
5. The *side length* is measured by a straight line from the middle of the clavicle through the nipple to the lowest border of the ribs; and finally,
6. The *acromial breadth* is the distance of one acromion from the other.

* Watson's Lectures, 4th edit., vol. ii., p. 144.

† Wilks: Pathological Anatomy, p. 212.

I have measured the extreme degree of inspiration with a band divided into centimetres. It is understood that particular attention be given to the band being everywhere at an equal level.

Spirometry.—If the thorax were so built that the proportions of its walls (its dimensions) were at all constant according to mathematical laws, if the heart had a definite relative size, if the thickness of the layer of muscles were in a definite proportion with the length of the body, or any part of the body, or the age, it would be a simple process of arithmetic to find the *contents* of air of the lungs; and the spirometer alone would not only teach us most precisely that a part of the lungs is impermeable to the air, but it would give us accurate information as to the amount of the lungs which has become impermeable. But these proportions do not exist in the thorax, for it is neither cylinder, nor tube, nor cone; its form approaches, as is known, to a truncated cone; its muscular covering varies very much in different individuals; the size of the heart and the mediastinum cannot be calculated; therefore a precise calculation of the capacity of the lungs is a matter of impossibility. But this precision is not essential, and the spirometer promises to become one of the most excellent diagnostic helps in diseases of the chest. The use of the spirometer will certainly become more general than it is at present, when many physicians do not even know its name, much less its use. Hutchinson is usually called the inventor of the spirometer, but, besides Goodwin, Davy, and Thompson, Abernethy was one of the first who, for the purpose of diagnosis, made spirometrical experiments. Küchenmeister, in reference to it, makes the following interesting remarks from the "Traité de l'Auscultation Médiate," by M. Laennec:—

"Le Docteur Abernethy, guidé sans doute par les recherches de Goodwin, Davy, et Thompson, sur la quantité d'air habituellement contenue dans les poumons, a cherché à s'assurer de la perméabilité de ces organes en mesurant la quantité d'air qui en sort dans l'expiration. Pour cela, après avoir établi une sorte d'appareil pneumatique au moyen d'un large verre plein d'eau, qu'il renverse dans une bassin également plein d'eau, il recueille sous ce verre, à l'aide d'un tube recourbé, tout l'air expiré par le malade à la suite d'une profonde inspiration. Il marque alors la hauteur de l'eau qui reste dans le verre, et en mesurant l'espace compris entre la marque et le fond du verre il peut approximativement calculer le volume d'air expiré. L'expérience serait plus exacte, si, au lieu d'un verre, on se servait d'une cloche graduée. La quantité d'air rejetée à chaque expiration chez une personne en santé étant d'à peu près 655 centimètres cubes, on peut affirmer que les poumons sont en partie imperméables si l'on trouve que cette quantité n'est que de 200—300 centimètres cubes." "Je ne pense pas (adds Meriadec Laennec) qu'avec les signes positifs que nous possédons aujourd'hui, personne ne soit tenté de recourir à cette expérience comme méthode d'exploration. Je ne l'ai citée, au reste, que parce que le traducteur Anglais a paru y attacher quelque importance, et la signalée sous le nom de pulmométrie."

As we see from this description, the construction of the spirometer used by Abernethy in his experiments before the year 1831 was of a much more simple character than that of the apparatus of Hutchinson. Spirometry, however, had not then obtained general use; at least it is not known that anybody else had particularly occupied himself with it. But when Hutchinson described his spirometer, great hopes were placed in this instrument, and it was believed that a new epoch of physical diagnosis had commenced. Therefore a great number of eulogists spoke on behalf of spirometry, but they did not succeed in procuring a universal adoption of the instrument. The difficulty arose: supposing the exact capacity of the lungs could be measured in a state of disease, a conclusion on the case could be arrived at only by a knowledge of the capacity of this individual in good health; in short, a measure was needed of the amount of respiration in healthy persons. All those who took interest in spirometry set to work in order to find this measure. Hutchinson and Wintrich, after numerous investigations, thought that they had established the facts—that the amount of respiration in man is in proportion to the height of his body; that the greatest respiratory power is found between the ages of twenty and forty; that with men of this age we might reckon, for each centimetre of his height, between twenty-two and twenty-four cubic centimetres of air of expiration; but with women, only between sixteen and seventeen and a half cubic centimetres.

Simon, who has made many careful investigations, was of opinion that the length of the thigh influences the amount of respiration. Fabius, however, found enormous disproportions. He very correctly says, that by means of such numerous inves-