this is more especially the case as we approach the apices of the lungs. Whether it is justifiable to tap all the various cavities to be met with, remains to be seen; but I fear that little benefit will result from operation upon those occurring in bronchiectasis, where the bronchial tubes are irregularly dilated in many places. It may also be argued that it is useless to operate in those occurring in phthisis, upon the plea that it will not arrest the disease; but I maintain that it is only necessary to look at the temperature-chart of a patient, with a large cavity in the lung, in order to see that, if we could remove the pus contained, we might free our patient from many of his septicæmic symptoms, and probably enable him to live a little longer in comparative comfort.

I have lately seen two cases under my colleague, Dr. Gilbert Smith, in which extensive excavation existed, with an up-and-down temperature-chart. In both these cases, at the *post mortem* examination, the cavities were found to be immense, being bounded only by the thickened and adherent pleuræ, whilst they contained much fetid pus. In both, during life, bulging of the intercostal spaces occurred in expiration. These cases could not have been injured by operation, whilst their condition might have been temporarily ameliorated.

Dr. Cayley and Mr. Pearce Gould have lately reported a successful case of drainage in gangrene of the lung, in a child, which is a good example of what may be done by a timely operative interference in suitable cases.

In conclusion, I am desirous of recapitulating the points which are of importance in the treatment.

1. In pleuritic effusion, early evacuation of the fluid is advocated by the siphon principle, discarding the aspirator.
2. In empyema, pus should be withdrawn at once, by the siphon or by the aspirator, with the use of the manometer, and the pleural cavity irrigated.
3. Incision is called for where large empyemata have existed for some time in old or rigid chests, or where irrigation, having been practised several times, has failed.
4. Where incision fails to effect a cure, resort must be had to resection of ribs.
5. Paracentesis, with drainage, should be employed in the treatment of lung-cavities.

ON ASPIRATORS: THEIR USE AS A MEANS OF DIAGNOSIS AND TREATMENT IN DISEASE.

Read in the Section of Pharmacology and Therapeutics.

By F. BOWREMAN JESSETT, F.R.C.S.,
Surgeon to the Royal General Dispensary, London.

THE great importance of the use of the pneumatic aspirator as a means of diagnosis and treatment in many diseases, is not, I believe, so fully recognised in this country as it deserves.

How often have we, as surgeons, met with deeply seated swellings in the abdomen, and limbs, and have been quite uncertain as to their character! We have all met with sarcomatous growths which, from their elasticity have given to one the idea that they contained fluid of some sort. I have witnessed, on more than one occasion, a patient operated upon for ovarian tumour, which, when the abdomen was opened and the cyst tapped, proved to be a large hydatid, connected with the liver or elsewhere; the nature of which, had it been explored with the aspirating needle before the operation, would have been recognised, its contents withdrawn, and the patient cured without being put to the risk of abdominal section.

I propose, to-day, to inquire into: 1st, the history of the aspirator, and the different forms in use; 2nd, the use of the instrument as a means of diagnosis; 3rd, its use as a means of treatment.

HISTORY.—The first instrument of which I can find any account, was introduced and suggested by Dr. Newington of Ticehurst. He got the idea from his brother-in-law, a colonel in the army, who told him he had constantly seen the natives, in India, thrust long pins into their livers, often several at a time, without producing any inflammation or other bad effect. Dr. Newington was at once struck by this story, and recognised how important, as a therapeutic agent, an instrument would be for emptying abscess of the liver. He therefore invented an instrument, consisting of a hollow needle with a small India-rubber ball at one end. It was intended to force the air out of the ball, and thrust the needle into an abscess of the liver, a distended bladder, or any other internal organ, from which a fluid was to be extracted, and, by relaxing the pressure upon the India-rubber ball, withdraw the contents.

This instrument he sent, with a full description, to Dr. Simpson of Edinburgh, twenty-three years ago, or about the year 1861. The instrument, although of great use, was imperfect, as, if there were more fluid in the cavity to be emptied than would fill the India-rubber ball, the needle had to be withdrawn, the ball emptied, and the needle reintroduced. To get over this difficulty, he introduced a tap into the shaft of the needle, and the bottle was made so as to be easily removed from the needle, leaving it *in situ*, emptying the bottle and refilling it to the needle.

It was not until the year 1869 that the instrument attained anything like perfection, and the importance of the use of the aspirator was fully recognised by Dr. Dieulafoy of Paris. This gentleman adapted an ordinary glass syringe, capable of holding three or four ounces of fluid, for the purpose. The syringe is furnished with two taps at the end, by closing both of which, and drawing up the piston to its full extent, a vacuum is formed; there is a notch in the piston-rod which, when the piston is fully drawn out, is fixed by a slight twist from left to right, so that the piston cannot be driven down by atmospheric pressure. The needle or trocar is then attached to the aspirator, if necessary, by means of caoutchouc tube. The tap corresponding to the cannula is opened, and the fluid flows into the pump. When this is full, turn the tap off, and open the other, force the piston down, and empty the pump; then, by turning both taps off, and drawing out the piston, again reforming a vacuum, and repeat the process until the cavity is empty, or you think you have withdrawn enough fluid. The instrument being made of glass, you can at once see when the cavity is empty by the fluid ceasing to be drawn into the vacuum of the aspirator.

Dr. Dieulafoy recommends four needles of different sizes, namely, $\frac{1}{16}$, $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ of an inch in diameter, and he calls these No. 1, 2, 3, and 4 needle.

Dr. Protheroe Smith claims priority of invention to Dr. Dieulafoy, as he suggested a set of exploring needle-trocars with exhausting syringe attached, which he exhibited, in the year 1867, at the annual meeting of the British Medical Association held in Dublin. His instrument was only a slight improvement upon that suggested by Dr. Newington, and not nearly so perfect as Dr. Dieulafoy's. We find, however, that Dr. Brising of Brussels disputes the claim of Dr. Dieulafoy to be the original inventor; and he published a pamphlet, in September 1869, in which the identical syringe is depicted, it having been used in the case of the Crown Prince of Belgium. Dr. Brising maintains that Dr. Dieulafoy, by some modifications he introduced, spoiled the instrument.

There does not appear to have been any improvement in the instrument until the year 1874, when Messrs. Weiss and Son introduced an improvement. It consisted of a reservoir of either glass or metal, an air-pump, the necessary tubes and needles. The instrument has these advantages; the reservoir is capable of containing a much larger quantity of fluid than Dieulafoy's syringe, and is emptied by a tap at the bottom. The tube is fitted with a three-way stopcock placed over an India-rubber cork, which fits accurately into the top of the reservoir.

In the latter part of the same year, Messrs. Salt and Co. of Birmingham submitted a new form of aspirator; this instrument was originally made by Charrière of Paris for Dr. Dieulafoy. The instrument is fixed to a table for use, so as to leave both hands of the operator free. The piston is worked by a rack-and-pinion action, with lever handle, whereby it can be raised with great ease to any part of the cylinder, where it is fixed by a self-acting catch to prevent recoil. Three taps are provided, so that a twofold operation can be performed by emptying the cyst and washing it out afterwards with water or any medicated fluid the surgeon may wish to use.

Mr. J. Wood, in 1875, suggested a slight alteration; namely, instead of a three-way tap at the top of the bottle, as in Weiss's instrument, to have a simple stopcock on each side of the stopper.

Dr. Gritti of Milan, in 1876, suggested a very simple and inexpensive form of aspirator. The instrument consists of a double-ended India-rubber syringe, resembling an ordinary Higginson's syringe, to the tubes of which are fixed nozzles adapted to fit into aspirating needles or trocars. Before using the instrument for aspiration, the tubes and ball are filled with water, and, after introducing the needle into the cavity to be emptied, the inlet-tube is fitted into the needle, and the instrument worked in the ordinary way until the desired amount of fluid has been withdrawn. If it be desirable to inject or wash out the cavity with any antiseptic, this is readily done by reversing the apparatus and fixing the outlet-tube on to the needle. In 1874, Messrs. Salt and Co. fitted a director to the ordinary needle, so that, if the surgeon think it desirable to make a free opening after evacuating the fluid, the needle can be withdrawn, and the director used as a guide.

Dr. Godrich, recognising the danger of the point of the needle wounding the lung, or any other viscus or serous membrane, while aspirating a cavity, suggested a double cannula, the outer one with the point to draw back over the inner one, so as to sheath the point.

Sir Joseph Fayrer introduced a modification in the instrument, which is worked with a flute-stop similar to that used in the stomach-pump. A piece of glass is introduced into the India-rubber tube, and the needles are made very much larger, and the points guarded.

Dr. Moses Gobard describes an instrument which, for its simplicity and portability, recommends itself to one's notice. It is simply a piece of India-rubber tubing connected to an India-rubber stopper, which will fit any ordinary bottle; to the end of one tube is fixed the needle, and to the other a thin flexible India-rubber ball. The *modus operandi* of the instrument is this: a small quantity of ether, or other volatile fluid, is put into the bottle, the stopper is forced into it, and the bottle is plunged into hot water; the fumes of the ether expel the air out of the bottle, which is replaced by ether-vapour. Turn the stopcock attached to the needle or cannula, and place the bottle into cold water, which condenses the vapour of the ether, and a vacuum is formed, as witnessed by the collapse of the thin India-rubber ball.

Dr. Potain's instrument is the most perfect at present in use. It consists of an exhausting syringe connected to an India-rubber stopper that will fit any ordinary bottle. At the other side of the stopper is another, but to which is connected the needle or trocar. The stopper being fitted into an ordinary bottle, the air is exhausted by the syringe, and the instrument used in the ordinary manner. Dr. Potain has introduced a number of long trocars and cannulae to his instrument, a common socket fitted with a tap being adapted, so as to fit all the cannulae accurately. The cannula having been inserted into the cavity to be emptied, the trocar is withdrawn and the tap turned, and the pneumatic aspirator affixed. He also has some blunt pointed probes made, which fit the cannula accurately, and which are used in case the cannula should become blocked.

The great objections to this and the other aspirators described are the price, and the fineness of the needles or cannulae, so that they become very easily blocked up. To avoid this, I have suggested a form of aspirator which has been made for me by Messrs. Maw, Son, and Thompson, which, from its simplicity of action and moderate price, will, I hope, recommend itself to all. It consists of a wide-mouthed bottle, to the top of which is accurately fitted a metal cap, connected with which, on one side, by a strong caoutchouc tube, fits an ordinary Higginson's syringe, to the other extremity of which is another tube fitted with a nozzle, which is adapted so as to fit accurately the needles or cannulae. To the other side of the brass cap is the inlet tube, one-fourth of an inch in diameter, fitted with a strong piece of tubing to a nozzle, which fits all the needles or cannulae. There are three needles, $\frac{1}{8}$, $\frac{1}{4}$, and $\frac{1}{2}$ of an inch in diameter, all of which fit a common connecting point furnished with a tap. The object of this is that, when the cyst is emptied, if the surgeon wish to inject an antiseptic fluid, he can do so by disconnecting the syringe from the bottle, and affixing it to the cannula.

As, by this instrument, it is impossible to exhaust all the air in the bottle, I have adapted a thin leather valve to the inlet pipe, so that, should any violent inspiratory effort cause a suction on the pipe, the valve will close, and thus prevent the return of any air or gases. While the bottle is filling with fluid, the India-rubber syringe is kept at work, and so, in a very short time, the cavity can be emptied. At the same time, should the patient show any appearance of dyspnoea, the operator can stop at once. By this instrument, by removing the bottle and attaching the India-rubber bottle directly to the needle, you can pump the contents directly away, and also, if you wish to wash out the cavity, you have simply to reverse the action of the syringe.

THE PNEUMATIC ASPIRATOR AS A MEANS OF DIAGNOSIS.—Perhaps there is no part of the body in which the aspirator may be used with so great advantage as in the abdomen, for the purpose of diagnosing tumours, etc. Patients often present themselves with hard, perhaps small, tumours of the liver, and it is difficult to determine whether they are abscesses, hydatid cysts, or malignant growths; the use of the aspirator at once sets the question at rest. In a case reported by Dr. Laffan, a patient, a hard drinker, presented all the symptoms of abscess of the liver. To decide the question, he determined to introduce Dieulafoy's aspirator, which he did in six different places, with a negative result; thus the diagnosis of abscess was proved to be incorrect.

Mr. T. Pridgin Teale relates a somewhat similar case, in which he was called to examine an abdominal tumour. A large, apparently

solid tumour, of uneven surface, in which fluctuation could not be detected, filled the lower part of the abdomen. Seeing that the tumour, if ovarian and non-malignant, was probably polycystic, he introduced the needle of the aspirator, first in one prominent part and then in another, and drew off, in the first instance, an ounce of tinted viscid fluid, and in the second, clear limpid fluid. Thus was proved the existence of a multiple cystic disease of the ovary.

Another case, occurring in my own practice some time since, that illustrates this well, was that of a very fat woman, who had a tumour in her abdomen of the size of a large coco-nut. I diagnosed ovarian tumour. Another surgeon who saw her thought it was a fibroid; I decided to introduce the aspirating needle, and so decide the question, which was done, with the result of withdrawing a quantity of characteristic ovarian fluid. I operated upon the woman, removed an ovarian tumour, and she made a good recovery.

It is often very difficult to determine the character of tumours connected with the ovary and uterus; and here the aspirator is of the greatest possible service, and I cannot help thinking that, if it were more frequently used, there would not be the occasion for so many exploratory abdominal sections.

Then, again, in obstruction of the bowels, frequently it is most difficult to determine where the obstruction is. If the obstruction be solely situated in the rectum, or lower part of the sigmoid flexure, and if it be of such an urgent character as to demand immediate relief to the patient by opening the colon in either the right or the left loin, or in the sigmoid flexure itself, here the aspirator is of great service; as if, in thrusting the needle into the descending colon, no flatus or liquid faeces escape, you may fairly draw the inference that the disease extends higher than the point at which the needle was inserted; on thrusting the needle again into the ascending colon, if flatus and liquid faeces do escape, then we know that the disease is situated lower down. In such a case, the surgeon would be saved the mortification of cutting down on and opening a portion of the gut that is already invaded by disease, a circumstance which would enforce his performing a second operation on the opposite side, and so increasing the danger to the patient's life very materially.

A case of a lady who had been under the care of one of our most illustrious London physicians for supposed cancer of the liver is one in which, if the aspirator had been used, all doubt would have at once been dispelled. When she came under my care, she was apparently within a few hours of her end; she had a large tumour, extending from the right iliac fossa, occupying the whole right iliac and hypochondriac regions, extending forwards over the epigastrium, and occupying the greater part of the left hypochondriac region. The tumour was hard, smooth, and tender. The patient was suffering from vomiting, and when I saw her in a state of collapse. The bowels had been open, with slight liquid faeces. I immediately suggested that the physician under whom she had been should see her, which he did the same evening. He then told me our patient had cancer of the liver, and would die in the course of twenty-four hours; at the end of that time, however, she was alive, and another physician was called, who corroborated in every particular the diagnosis of the former physician. I asked him if he had any objection to my giving large enemata, as I had an idea the patient was suffering from a loaded colon. He gave his consent; and, in less than a week, the tumour had all disappeared, and the patient is now alive and well.

I mention this case as one in which, if the physician she first consulted had inserted an aspirating needle, all doubt as to the nature of the tumour would have been settled long before it was, and the patient would have been treated for the disease from which she really was suffering, and her life would not have been imperilled.

A short time ago, I saw a case of a girl with angular curvature of the spine, and a good deal of pain in her abdomen, extending to her left thigh. On deep pressure, there was found to be a very decided fullness down the left side of the spine, apparently along the sheath of the psoas and iliacus muscles, but no fluctuation was discernible. I introduced the needle of the aspirator into the swelling, and withdrew a large quantity of pus. The pus, however, quickly reformed, and I then made a free opening into the abscess, in a line with Poupart's ligament, and washed the cavity out, inserting a large drainage-tube. Had I, in this instance, had a sufficiently large cannula, I am convinced I could have withdrawn the whole of the thick curdy pus that I removed by the second operation.

These cases could be multiplied to any extent, and I venture to think that there are very few of you but have witnessed such cases as I have mentioned.

Chest.—There is yet one more example in which I believe the aspirator might be used with very great advantage. I refer to cavities in the lung. At the Royal Medical and Chirurgical Society, a few

weeks ago, a most interesting debate took place on what promises to be a good and safe method of treating cavities in the lung, either tubercular or those caused by gangrene or pyæmic abscess. But there was one point that struck me as very important, and that was the difficulty experienced by physicians in determining the exact position of the cavities to be treated. I cannot help thinking that here the aspirating needle will play a very important part, as, by introducing the needle of an aspirator armed with a director into the suspected part, if the surgeon failed to hit the cavity the first, second, or third time, no harm would be done; and at the same time undoubtedly directly the needle entered the cavity, the surgeon would be apprised of the fact by the withdrawal of the matter contained in the cavity. The needle would then be withdrawn, the director being left in, and the surgeon would have a good and safe guide to the cavity which he wishes to keep drained, without putting the patient to the unnecessary risk of more than one opening into the chest before the cavity was discovered.

Then, again, in effusions into the pleura, it is often difficult to determine whether the case is one of simple pleuritic effusion or empyema.

A case came before my notice only a short time since, in a lad who had had some consolidation of the base of the right lung; from this he had recovered, but there was left a dulness over the whole of the lower part of the same side of the chest, with persistent high evening temperature, and it was a question whether there was a secretion of pus in the cavity or not. The needle of a fine aspirator was introduced into the lower part of the chest, and a small quantity of serum withdrawn. Thus the question was solved, and in a short time he was sent to the seaside; the effusion was absorbed, and the dulness completely disappeared.

Deeply seated Abscess.—In deeply seated abscess, the aspirator is of the greatest possible service, as often patients come before us with swellings deeply embedded in the muscles of the limbs. When there is no perceptible fluctuation, in fact, the swelling feels hard and inelastic, but often there are only collections of pus, or cysts; a fine needle of an aspirator introduced quickly decides the nature of the swelling. Dr. Moore relates a case of a delicate boy, aged nine years, who for months had been under treatment of a hospital surgeon for a swelling in his thigh, and had been subjected to various kinds of treatment by local applications. The swelling was situated in the front and lower fourth part of the femur, evidently under the fascia. He quickly introduced the finest needle of Dieulafoy's aspirator, and removed about three ounces of pus. The thigh was next strapped round, to bring the walls of the abscess together; the patient was sent to the seaside, and had no return of the abscess.

THE ASPIRATOR AS A MEANS OF TREATMENT.—Having drawn attention to a few forms of disease in which the aspirator is of use to the physician or surgeon in the diagnosis of disease, I will now endeavour to point out the diseases in which it may be used as a safe and efficient means of treatment. For this purpose, I have availed myself of all the literature I can find bearing upon the subject. From the interesting and exhaustive experiments of Dr. Dieulafoy, he insists most strongly on the use of the aspirator as a means of diagnosis and treatment. It serves in the first place to show with certainty the presence, seat, and character of various pathological fluids, and also to dry up the source of such fluids. He asserts that it is always possible to reach with certainty, and with no kind of danger, any collection of liquid, whatever may be its situation and its nature; that aspiration may be repeated without any bad results, and almost always with the result of drying up the source of the fluid. He lays down the following law as the result of his experience, and I do not think we can do better than act by it. "When a fluid, whatever be its nature, gathers in a serous cavity, or in any organ, and when that cavity or that organ is accessible without danger to the patient, our first care should be to withdraw that liquid; if it again form, it must be again withdrawn, repeating the operation frequently, if necessary, until the serous membrane is exhausted by a purely mechanical and quite inoffensive means, and without attempting to modify the secretion by irritating and sometimes dangerous agents." The principles of this rule are undoubtedly good, but I think now the latter part of it may be somewhat modified; I refer to not attempting to modify the secretions. I think, without doubt, that much good may be effected by washing out cavities that have contained collections of pus with some disinfecting fluids, and, in some instances, I have no doubt it is advisable to inject fluids that will set up a certain amount of inflammation in the cavity.

The disease in which aspiration may be employed with success may be divided into five groups:

1. Fluids accumulating in serous cavities: that is, hydrocephalus, hydrarthrosis, pleurisy, empyema, pericarditis, and effusion into synovial cavities;
2. Fluids formed in deep parts of organs: abscesses in hydatid tissues of the lungs or liver, cysts of spleen, omentum, ovarian cysts, retention of urine, strangulated hernie;
3. Liquid formed within the cellular tissues of various regions: congestive abscess, bubo, perinephritic abscess, iliac or psoas abscess, peritoneal abscess;
4. Collection of air or gases in cavities or organs: *e.g.*, pneumothorax, tympanites, and strangulated hernial;
5. Removal of *débris* from the bladder after lithotripsy, and diagnosis of tumour in the bladder.

Effusion into the Pleura.—There can be no doubt, I think, that when fluid is formed in the cavity of the pleura, the quicker it is removed the better; that is, if it can be done without danger to the patient by the admission of air into the chest. How often one meets with chest-deformity, the result of old pleurisy, where the fluid has either been allowed to remain in the chest, until such time as absorption has taken place, or until it is found that the fluid still continues unabsorbed, notwithstanding the use of medicine and internal absorbent applications, when it is removed by tapping; not, however, until the lung is compressed, and in very many cases bound down by adhesive inflammation, and by bands of lymph. When once the physician is convinced that fluid is secreted in the pleural cavity, even in the acute stage, I am convinced that the sooner the fluid is removed by aspiration or by siphon-tube the better; and even if the operation have to be repeated two, three, or four times, yet no mischief is likely to arise from the operation. On the contrary, by relieving the pressure on the venous circulation, the congested state of the lung will be relieved, and the patient be in a much more favourable position for recovery. In cases of chronic effusion, where the lung is already compressed, then it would be wise to remove the fluid as early as possible, and give the lung a chance of expanding again and regaining its functions. The same rule applies in empyema; but in this case I think much good may be done by washing the pleural cavity out with some weak antiseptic lotion.

In chronic cases, great care must be taken not to remove the fluid too quickly; in fact, you cannot be too cautious, as there is always a fear of syncope ensuing. The reason of this is obvious, as the lung on the diseased side being bound down, and possibly diseased, or in parts in a state of collapse, the healthy lung cannot adapt itself at once to fill the cavity which has been emptied, and venous congestion and syncope are very likely to take place. Dr. Douglas Powell, Dr. Godrich, Dr. Behrer, and others, have drawn attention to this point. I cannot, however, but think that the danger from this source has been somewhat overrated; at any rate, out of a number of cases I have seen operated on, I have never seen any dangerous symptoms take place. Neither can I understand how such a state of things could take place; as it is evident that, unless very great suction-power be exercised, it would be impossible to draw out the fluid so as to give a vacuum in the chest. The aspirator that Messrs. Maw and Co. have made, and which I now have the pleasure of introducing to the notice of the Association, at any rate obviates all risk of such an accident, as by it you have the reservoir completely under control, and you can exercise any amount of suction you like.

In cases of chronic pleurisy, however, I should prefer aspirating the chest on more than one or two occasions, and emptying little by little, and so giving the damaged lung time to recover itself, without putting any very great extra labour on the lung on the sound side.

Dr. Godrich has drawn attention to the fact that he has seen the lung wounded on more than one occasion. This may be obviated by using a needle with a sheath to it; so that, as soon as you have introduced the needle into the chest-cavity, you can withdraw the point of the needle into the sheath; or the needle may be bent over at an angle of about 40°, so that the lung shall not be drawn upon the end of the cannula.

In cases of empyema, it has been objected that, although you may empty the chest again and again, yet the pus will rapidly reform; and that, therefore, it is far better to perform paracentesis with an ordinary trocar and cannula, and to introduce a long drainage-tube, the end of which is to be emptied under a solution of some antiseptic. It is urged that in this way the chest-cavity can thus be kept washed out as often as is required. I cannot myself see any advantage in this, as the chest may be aspirated and washed out as often as necessary without any danger to the patient's life. Other surgeons advocate a free incision in one of the intercostal spaces, and emptying the chest.

Pneumothorax.—In some cases of traumatic pneumothorax, I think

aspiration may be practised with the best possible results. Dr. Herbert Page has published a case in which, owing to a wound of the lung caused by the in-driving of a fractured rib, there was pneumothorax, with total collapse of the right lung. There was great dyspnoea and collapse. The chest was punctured, four hours after the accident, by Dieulafoy's cannula; and, on exhausting the air from the pleural cavity by means of the pneumatic aspirator, immediate improvement in the condition of the patient followed. At the time of the operation, blood was drawn into the receiver; and an examination of the chest on the day after the injury revealed dulness on percussion at the base on the left side, due to the presence of blood. The aspirator was used three times subsequently, for the removal of the blood and the further withdrawal of air from the pleura. The patient made a good recovery. Dr. Page, while admitting the advantages of the use of the aspirator in these cases, drew attention to a possible source of danger from hæmorrhage into cavities exhausted of their contents by the aspirator. There can be no doubt that, in a case of wound of a vessel in the lung by the broken rib, accompanied by pneumothorax, the withdrawing the air from the pleura might, and probably would, encourage bleeding from the wounded vessel; but here, as in effusion of fluid into the pleura, I would urge the great importance of withdrawing the air very gradually, and not attempting to empty the chest-cavity entirely at the first aspiration. If this precaution be taken, I cannot think there is any very great risk of increasing the hæmorrhage. At any rate, as in the case related by Dr. Page, the relief given quite outweighed any danger there might be from such a source.

Pericarditis.—Removing fluid from the pericardium, by means of aspiration, in effusion into the pericardium, has been now practised in this country pretty often, but very much more so in France and Germany. Mr. Bartleet, of Birmingham, tapped a case of Dr. Russell's, who was suffering from acute rheumatism, urgent dyspnoea being the prominent symptom. He withdrew fourteen ounces of fluid, and the patient did well. Dr. Shingleton Smith also reports a case in which he removed a quantity of fluid from the pericardium, and the patient made a good recovery.

Ascites.—There can be no doubt of the use of the aspirator in removing fluid from the abdominal cavity in cases of ascites. The advantages over ordinary tapping are that the fluid can be withdrawn slowly and gradually, and can be stopped directly the patient shows the least sign of faintness or dyspnoea. The operation is so simple that it can be repeated again and again without any fear of setting up local inflammatory mischief.

Liver.—There is, perhaps, no organ in the body which is so subject to abscesses and hydatid cysts as the liver; and, in these cases, the aspirator can be introduced, the abscess or hydatid emptied, and the patient, in all probability, cured; at any rate, he is put in a very much better position than he could possibly be by any other mode of treatment. Before the aspirator was invented, in cases of abscess of the liver, we were obliged to wait until there was adhesive inflammation, causing the peritoneum covering the abscess to adhere to the parietal peritoneum, before the surgeon could venture to open the abscess either by the lancet or by the trocar and cannula. Abscesses have often emptied through into the peritoneal cavity, with the result of the death of the patient, or they may have burst into some portion of the intestine, and so emptied themselves, in which case the patient usually recovered; they may perforate the diaphragm, and burst into the lung, the pus being expectorated, and here again many patients have recovered. While, however, the abscess was eating its way into these organs, the patient's strength often failed and he died.

The introduction of the aspirator has happily been the means of our saving many poor sufferers from months of agonising pain, and also very many have been restored to health by its early application. I think it cannot be too forcibly impressed upon every physician or surgeon, that, if a patient present himself who has a circumscribed hard swelling in the liver, the nature of which is doubtful, it should at once be punctured with the aspiration-needle, and if it should turn out to be an abscess or hydatid cyst, by means of the pneumatic aspirator the cavity can be emptied. Again, I would go further and say that, if the patient present any symptoms of hepatic abscess, and if there be any one tender spot traceable over the liver, the surgeon is quite justified in puncturing the liver at the tender spot, with a view of discovering an abscess.

Surgeon-Major Condon has recorded twelve cases that came under his notice and treatment: seven perfectly recovered and five died; of these five he points out that: "Four of them were in a dying state when received by me under treatment, and the operation was merely resorted to as a *dernier ressort*, and with the satisfactory results of relieving suffering and prolonging life." In one case he tapped

an abscess fourteen times, when a second abscess was discovered, which was tapped sixteen times, and the patient was enabled to be removed to a P. and O. steamer, and conveyed to England, where he died. Mr. Condon remarks that the enormous quantity of pus taken from the liver (about four hundred ounces) is, he believes, the largest quantity taken from a human liver on record. Numerous other cases have been reported by Sir Joseph Fayrer, Dr. Ball, and others. Dr. Beahmy has practised it in many cases, and all but one were successful, in which case he did not reach the abscess.

In some cases recorded, when liver-abscess was suspected, the liver was punctured sometimes several times, and no abscess was discovered; but the patients were very much relieved by the operation, the pain disappeared, and the distressing symptoms were much alleviated.

Dr. Heaton reports a case of hydatid of the liver successfully treated, and draws attention to the advantage of this instrument over the trocar and cannula, as in the latter you have to set up adhesive inflammation of the peritoneum before tapping. Cases also have been reported by Mr. Jessop, and also by many French surgeons.

Tympanites.—Aspiration has been practised successfully in extreme tympanites, and in emptying ovarian cysts; but I do not know that there is much advantage in this instrument over the trocar and cannula in these affections.

Distension of the Bladder.—In distension of the bladder due to either impermeable stricture or traumatic rupture of the urethra, or either enlargement or cancer of the prostate, when it is found impossible to pass a catheter, I have had great reason to be satisfied with the use of the pneumatic aspirator, the bladder being punctured with a fine needle over the pubes; and here I recommend the use of a large curved needle, so that you can efficiently empty the viscus.

In one case I had under my care, of impermeable stricture of the urethra, with retention of urine, in which I failed to pass a catheter, I emptied the bladder with the aspirator over the pubes; and in a few hours afterwards, the spasm being relieved, the patient passed his urine by the urethra. I was enabled to pass a small instrument through the stricture, which I split up, and the patient made a good recovery.

Hernia.—The French surgeons have practised with good results aspiration in cases of strangulated hernia, and in our own country cases have been reported by Mr. Jessop, of Leeds, and others. The cases in which it appears to me that such a course might be adopted are those in which there is a collection of fluid in the sac which prevents the surgeon from being able to use direct pressure on the strangulated gut, and cases where there is a collection of flatus in the gut itself, which increases its calibre and prevents its return. In such cases as these, it is not difficult to see that great good might result by aspiration; and if, after removing the fluid in the sac, or the flatus from the gut, we fail to be able to return the hernia, I do not think the patient is placed in any worse position for operation than before.

Dieulafoy reports twenty-seven cases in which he used the aspirator for strangulated hernia, twenty of which were successful reduction of the gut by taxis following the operation. In the remaining seven cases, it was harmless; and of these, three died, and four recovered after the ordinary operation for hernia.

At University College Hospital, seven cases are reported, one followed by reduction, and no fluid was withdrawn from the sac; yet the impulse returned, and the patient recovered; in four, it failed entirely; in three of these, the ordinary operation was performed successfully; the remaining case was mentioned at the time of operation. At the *post mortem* examination, no gas could be squeezed from the punctures of the needle.

Joints.—In cases of effusion into the joints, much has been said and written; but I think now, in France especially, the importance of removing fluid from synovial cavities is fully recognised; and, in this country, it is practised very much more frequently than it was a few years since. In a discussion that took place some years ago at the Academy of Medicine in Paris, in which Dr. Verneuil, Demarquay, and others took part, the conclusions arrived at were that pneumatic aspiration in hydrarthrosis of the knee-joint, both in its acute and chronic form, is a most useful remedy. In the acute, when the pain is most severe, owing to dislocation of the capsule of the joint, and in the chronic form, that will not yield to any other treatment, the method of performing the operation is, I think, of great importance. An elastic bandage should be applied both above and below the knee, or broad strips of plaster would do nearly as well. These should be drawn tighter as the contents of the joint are withdrawn, which takes place very slowly, owing to the viscosity of the fluid. The cannula

should be from a $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in diameter, and the puncture should be made in an upward direction, but at the external edge of the patella. When the joint is emptied, a little styptic colloidion is painted over the puncture, a small pad of antiseptic gauze or lint placed over, and the whole joint evenly strapped up. The leg should be bandaged, and, if thought necessary, an ice-bag is applied to the joint, and the limb, for a day or two, kept at perfect rest, by the application of poroplastic splints. Mr. Jessop has practised aspiration successfully in pyæmic abscess of the hip- and knee-joints, and has also reported cases of pneumatic aspiration in ordinary dropsy of the knee-joint. In cases of fractured patella, with either effusion of serum or blood, Mr. Christopher Heath has now, for some time, practised emptying the joint by aspiration before putting up the fracture; in this way, he has obtained most happy results.

Abscesses.—Deep abscesses of the thigh or ilium, lumbar and psoas abscesses, may all be well treated by aspiration.

[Mr. Jessett exhibited and gave a demonstration of an aspirator suggested by him, and manufactured by Messrs. Maw, Son, and Thompson, London, which, from its extreme simplicity and moderate price, may be in the hands of any practitioner.]

Dr. FINNY (Dublin) confined his remarks to the treatment of purulent or seropurulent effusions in the thorax. In his experience, the best method was to give free vent, under due antiseptic precautions, by incision, to the fluid, which, so long as it remained, was a source of danger to the patient. Never having employed Dr. White's instrument, he had no intention to criticise adversely Dr. White's method of tapping the empyema, and by the siphon method draining it off before he resorted to incision. He protested, however, against the indiscriminate employment of washing out the pleural cavity with antiseptic fluid; as, unless the fluid were of a dangerous strength, it could do little or nothing as an antiseptic, and cases were on record of patients having evidenced toxic symptoms, due to the carbolic acid, the antiseptic employed.

Dr. GRAY (Castlewellan) agreed in the main with the remarks of Dr. Finny, that there was very little danger, with proper precautions, in opening the chest at once when it was ascertained that the effused fluid was pus, introducing a drainage-tube, and washing out the cavity. As an easy mode of introducing the tube, he recommended a common uterine sound to be introduced through the enlarged needle-hole, and pushed on until its point projected between two of the ribs, where it could be cut down upon, and pushed through. Upon this point, the drainage-tube could be drawn and tied; then, by withdrawing the sound, the tube could be brought out through the needle-hole, and the two ends could be tied together. Through this tube the pus drained, and through it the antiseptic fluid could be injected.

Dr. CULLIMORE (London) said that, owing to the limited time at his disposal, he would direct his observations to the treatment by aspiration of hepatic abscess. At the present time, and also during his service in India, he had considerable experience in the use of aspiration. Soon after its introduction, it was largely used; but he thought that its early gained success was not attended with the good results anticipated. When the abscess was deep in the substance of the liver, and the diagnosis was doubtful, then, after the lapse of some time to clear up the case, the aspirator might be used, sometimes with success, both as a method of cure, and as a means of diagnosis. When the diagnosis was certain, and the abscess pointed towards the surface, after a certain time being allowed for formation of adhesions, the best method was either to use a trocar and cannula, or even incision, with anæsthetic precautions. The objections to the use of the aspirator were that, from its great suction-power, it was liable to break down the walls of the abscess, and so increase the danger of the spread of the disease. As a means of diagnosis, in obscure cases, exploratory puncture should always be made. It could be done with safety, and contributed greatly, by clearing up the diagnosis, to the peace of mind of the patient.

Dr. WHITE, in reply, stated that several of the speakers had misunderstood him, owing to his having been unable to go thoroughly into the subject from lack of time. He was anxious to correct the misapprehension into which Dr. Finny and Dr. Gray had fallen, as to the statement that air, entering the pleura after antiseptic precautions, was injurious. This was not only not the case, but, as was well known, the introduction of air, rendered aseptic, had frequently been used, and without bad results. Again, Dr. Finny thought that pus was left in the pleura. On the contrary, irrigation was to be performed by alternate injection and removal of the antiseptic solution, until what returned was quite free from pus; therefore, what was left behind was merely an antiseptic solution. Carbolic acid either should not be

used, or, if employed, it should only be in the strength of 2 or 3 per cent. Numerous other solutions were to be preferred.

VISIT OF THE EGYPTIAN CHOLERA EPIDEMIC IN 1883 TO PORT SAID.

Read in the Section of Public Medicine.

By GILBERT KIRKER, M.D., Surgeon, R.N.

I HAVE thought that a consideration of the fact that, during the late epidemic of cholera in Egypt, the disease made only eight victims in Port Said, a filthy town with 17,000 inhabitants, would be of sufficient interest and importance to bring under the notice of this Association.

I shall first give a brief description of Port Said, more particularly with reference to its sanitary condition at the time of the appearance of the cholera; then a short history of the outbreak and the measures taken to combat it; and, finally, I will state what I consider to be the cause of the comparative immunity of Port Said, and what were the essential factors in the generation of the epidemic in Egypt.

From the Damietta mouth of the Nile to the Gulf of Pelusium, there stretches, separating Lake Menzaleh from the sea, a narrow strip of sand from two hundred to three hundred yards broad. This strip of sandy beach, at a point thirty miles from Damietta, and the ground made by throwing the dredgings from the harbour into the shallow lake, form the site of Port Said. The surface is flat, and only from four to five feet above sea-level. The soil is composed of sand, whitish in colour where dry and exposed to the weather, greyish lower down, and, at the water-level, almost black. The subsoil-water is saline, and its height varies considerably, being affected by the height of the water in the sea and lake.

Port Said consists of two towns, one inhabited by Europeans, and the other by native Egyptians. The former is situated close to the western side of the harbour, and the latter a short distance beyond.

To the north-east of the towns is the beach, a strip of sand about two hundred yards broad, intervening between the sea and the houses. On the opposite side, towards the south-west, the waters of Lake Menzaleh approach closely. The European town is fast extending towards the west, but there is still a piece of unoccupied ground, about one hundred yards broad, separating the last European from the first Egyptian houses.

In the European town the streets are broad, and run from north-east to south-west, and north-west to south-east, intersecting each other at right angles. The houses may be divided into three classes: 1st, those built by private individuals according to the regulations of the domaine contained in the contract of ground purchase; 2nd, those built by the Canal Company for its workmen; and 3rd, those built by the Greek colonists on the ground belonging to the Hellenic government.

The houses of the first class have at the basement a cellar and stand two or three stories high. The cellars are all badly ventilated, their floors are about five feet below the level of the ground, and, as would be expected, all are damp, while some are constantly flooded with water. Two of the conditions in the contract which the builders of these houses have to sign are "to construct a suitable cesspool, and empty it regularly," and "to construct a drain-well for the reception of the refuse-waters, which waters are, in no case, to have access to, nor be emptied, on the public streets." In conformity with these unsanitary regulations, each house has its cesspool and drain-well. The cesspool is constructed in the cellar, and receives all that enters by the water-closets in the upper stories. Most of the cesspools are closed in with masonry, but many are open. Some only are cemented inside, nearly all of them leak, and none of them are properly ventilated. The drain-wells do not exist universally in connection with these houses, as some have been filled up on account of their inconvenience or unsightliness; but where they do exist, their use brings about the saturation of the soil with foul water, and adds to the dampness of the cellars. Where there are no drain-wells, the water is poured into the cesspools, thrown into the cellars, or into the public streets. These different circumstances unite to make the cellars fearfully unwholesome places. They are damp; the floors of some are covered with water, which has entered from below, or leaked from the drain-wells and cesspools; they are the receptacles for dirt and filth of all sorts; in some of them are loathsome open cesspools, and all are badly ventilated if ventilated at all. The noxious exhalations from them ascend into the rooms above, where the people live, enter the adjoining houses, and in the open streets can be felt emerging from the cellar-openings.