sound by the propulsion of a moving column of fluid through a stationary body of the same fluid, I arrived at this conclusion: that, when pressure upon the fluid was raised to a certain point, sound could be with difficulty obtained. The application of this observation to Dr. Broadbent's question is obvious; and I have to thank him for bringing under my notice a pathological point which has a direct bearing on my theory of the first sound.

3. There is a well recognised difference in character between the synchronous first sounds, formed respectively in the right and left sides of the heart. "How does Dr. Leared explain these (differences), if the sounds be the product of collision of the blood, and not of tension of the ventricular walls and valves?" I explain this very simply by the fact that the conditions under which both these sounds are formed are as different from each other on my theory as they are on his, assuming Dr. Broadbent's theory to be the true one. I have just shown that pressure has much to do with sound; and I have a word more to say bearing on this point presently.

4. In dilatation of the ventricles, and in stenosis of the mitral orifice, the first sound is often louder than usual, but it is short and sharp like the second sound. "This is easily explained in the case of dilatation, if the ventricular walls and valves are supposed to be the origin of the sound. An explanation on the hypothesis of collision of moving ventricular and standing aortic blood is requested." It would require too much space to go into this matter in detail. But, so far as an indication of the direction of how it is to be explained, the request shall be complied with. First, I would say that I consider Dr. Broadbent's assertion that the matter is easily explained on the hypothesis mentioned, although plausible, is a long way from being proved. I have spoken of the difficulty experienced in forming sounds in fluids when they are under a certain pressure. If water be employed in the experiment, the sound produced under considerable pressure is always a blowing sound; although, if the pressure be increased, it approximates more or less to a shock sound. If a sufficiently viscid fluid be employed, and a low pressure, the sound is also a murmur. But, if the pressure be increased to a certain point, the sound becomes more or less a shock sound. If the pressure be still further increased, the shock sound becomes lowered in tone; and, if increased beyond a certain point, can hardly be heard at all. The explanation of Dr. Broadbent's difficulty lies in this: the first sound is loudest when the blood is under moderate pressure. If the pressure be much diminished, the sound is transformed into a murmur, as has been observed repeatedly in cases of excessive hæmorrhage. Probably, the first sound is loudest just at the point when the conditions, as regards pressure, are sufficient to form a shock-sound instead of a murmur. Now, in diminished ventricular power (dilatation) and in diminished pressure from want of supply of blood (stenosis), we have two conditions which lessen pressure and increase the loudness of the first sound.

5. In aortic dilatation and in aneurism, the second sound is louder and greatly changed in tone. This is easily explained, if it be admitted that the change results from the tension and vibration of the enlarged area of resonant membrane, but could scarcely be the effect of increase in the size of the column of blood.

But, why not? The resounding nature of membranes seems to haunt some men when arguing on this subject. They never can get the drum and tambourine out of their minds. Let me assure Dr. Broadbent that, when he whistles, it is the air issuing from his lips, and not the lips themselves, or the vibration of any of his membranes, which forms sound. In case of an aneurism, the enlarged body of fluid exercises its peculiar effect on the production and conduction of sound, so much so, that good authorities have maintained that sounds resembling both heart-sounds are formed independently in aneurismal sacs. But this subject is too large for further discussion here.

Dr. Broadbent's questions leave the main argument unassailed. They grasp at the shadow instead of the substance, and do not, except indirectly, attack the salient points, namely, the close analogy between the known conditions on which certain hydraulic sounds are formed and the existence of similar conditions in the human body. One point only to which I still attach "capital importance" has been handled, with what result let the "candid reader" decide.

LARGE AND LONG NEGLECTED POLYPUS OF THE EAR.

By H. BURFORD NORMAN, F.R.C.S. Eng., Southsea.

THE following case may serve as a useful companion to those cases of neglected aural polypi which were recorded by Mr. Field in the JOURNAL of December 16th.

Mrs. C., aged 62, but much older in appearance, consulted me on November 29th, on account of a growth in her left ear. It had existed ten or twelve years at least, and, for a large part of the time, without causing any great inconvenience. She had often shown it to her medical man, who never advised her to do anything for it; and, as she says, her mind being much more concerned for the care of her family than of herself, she let the matter take its course. Of late, however, the growth having increased much in size, and caused incessant pain and fetid discharge, with occasional bleeding, she thought she might get something done for her relief. On examining the ear, I found a large pinkish and somewhat spongy-looking mass filling up the cavity of the outer ear, pushing the tragus forward: it sprang from the depth of the auditory canal, which it filled. On examining the growth by the probe, and gently lifting it in a pair of bowed pile-forceps, a considerable gush of blood took place. In front of the ear, the skin was of a dusky-red colour, and swollen nearly to the cheek, and the temporal artery was felt throbbing and hard just in front of the tragus. The outer ear was also in a similar state—red, thickened, and rigid; whilst, below the ear, and on the side of the neck, besides a reddened state of skin, there was some induration of the lymphatic glands, and an ulcer discharging thick gummy matter. I put a compress and circular bandage on to stop the bleeding caused by the examination, and ordered the use of tepid-water and alum-injections whilst deciding what to do with the growth. The hearing on the diseased side was impaired, but not so much as might have been expected; and the growth seemed to have a perfectly "benign" character, for in its long life it had remained quite isolated.

From these considerations, I thought it probable that the growth was connected with some part of the circumference of the auditory canal, and not with the membrana tympani. I made several attempts to ascertain the point by the use of the probe, but in vain; it gave me no help, and could not be passed on all sides and around the growth, in consequence of its not only filling the meatus, but swelling out much, mushroom-like, over the edges of that passage. The same circumstance made it at least very doubtful whether I could either put a wire around the growth, or cut it off by knife or scissors at sufficient depth to be effectual. I therefore decided to apply torsion, either so far only as to cause strangulation, which I have seen answer well in slight cases, or to twist the growth off.

On Dec. 3rd, I put this plan in operation, grasping the outer part of the growth in the bowed forceps, and slowly twisting it once quite round. Finding this not very painful, I carried the proceeding further, and was gratified at finding the growth snap off when the second turn or twist was about half made, and in my possession a polypus more than two inches long, the lower and more slender part of which, having a smooth mucous covering, had filled the meatus, and measured two inches and a half in circumference; while the larger and protruding part was granular on its surface, and measured between three and four inches round.

A great gush of blood followed the removal of the growth, but it was quickly stopped by plugging the ear with long strips of lint soaked in strong solution of perchloride of iron, and this was secured by a compress of lint and bandage round the head. In plugging the ear, my forefinger passed readily to the bottom of the meatus.

Next day, I removed the compress and part of the plug, as they caused uneasiness; and, on the second day, the remainder of the plug, which was loose. Since then the case has done very well, and I saw my patient yesterday in good health, the swelling and redness of the auricle and neighbouring integument all gone, the ulcer on the side of the neck healed, and the auditory canal much reduced from its lately exaggerated size, and this notwithstanding a slight attack of erysipelas which followed the operation.

This is by far the largest polypus of the ear, and altogether the worst that I have ever met with—worthy, I think, of being recorded for an example of what may be done in such a case.

SOME EXPERIMENTS WITH NITRITE OF AMYL.

By W. LEMON LANE, M.B., etc., Crossgate, Dunfermline.

THERE is so little known about the action of this medicine, that I think a few experiments which I made with it will be interesting.

Experiments 1 and 2.—Two kittens of the same age and size got chloroform simultaneously. When both were thoroughly insensible, I gave one of them two minims of nitrite of amyl to inhale. The result was this. In the kitten which had no nitrite of amyl to inhale, reflex motion appeared in five minutes, and sensibility returned in eleven minutes thirty seconds; while, in the other kitten (which had amyl-

nitrite), reflex motion appeared in four minutes, and sensibility returned in six minutes. In this kitten, the cardiac sounds were nearly inaudible, and its action very rapid; but, upon inhaling the nitrite of amyl, the cardiac sounds became louder, and its action less rapid.

Experiment 3.—A kitten with a temperature of 100.2 degs. Fahr. (thermometer in the axilla) had nitrite of amyl to inhale, which raised its temperature to 100.8 degs. Fahr. In this case, the amyl-nitrite produced reddening of the nose and mucous membrane of the mouth. The dose being small, it did not make the kitten insensible. I may state that, twenty-five minutes after inhaling the nitrite of amyl, the temperature in the axilla was 100.6 degs. Fahr.

Experiment 4.—A kitten, whose temperature was 100.2 degs. Fahr., got chloroform; after it recovered sensibility, its temperature was 98.8 degs. Fahr. The fall of temperature caused by chloroform was 1.3. The kitten was trembling with cold. The number of minutes before reflex motion appeared was nine, and before sensibility returned was fifteen. The chloroform made the heart's sounds rapid and weak.

Experiment 5.—The same kitten was again, two days afterwards, made insensible with chloroform. The anaesthesia was complete at 5.27 P.M. Three minims of nitrite of amyl were then given for inhalation. At 5.29 P.M., reflex motion appeared; at 5.30 P.M., it tried to raise its head and move; at 5.32 P.M., it began mewing and standing. The nitrite of amyl produced reddening of the nose and mouth, while it made the heart's action stronger, less rapid, and its sounds louder. Its body felt quite warm. I unfortunately did not take its temperature with the thermometer.

Experiment 6.—The same kitten was again, two days afterwards, anaesthetised with chloroform. Ten minims of amyl-nitrite were then given, which, at first, made the cardiac sounds louder and its action slower, but its sounds soon got weak and its action rapid. Reflex motion appeared in three minutes; it began opening and looking about in four minutes; tried to rise in five minutes, and began walking, although it staggered a good deal in doing so, in six minutes. I may mention that, in this experiment, the large dose of nitrite of amyl produced cyanosis of the nose and mucous membrane of the mouth.

The following table will conveniently show the effect of amyl-nitrite on the chloroformic anaesthesia.

No. of the Experiment.	No. of minutes before reflex motion appeared.	No. of minutes insensible.
1. Chloroform only.....	5	11 minutes 30 secs.
2. Amyl nitrite after chloroform.....	4	6 minutes.
4. Chloroform only.....	9	15 minutes.
5. Amyl nitrite after chloroform.....	2	3 minutes.
6. Amyl nitrite after chloroform.....	3	4 minutes.

The average duration of insensibility, according to the above table, in kittens when chloroform only was given, was thirteen minutes; while in those that inhaled the nitrite of amyl after chloroform, it was four minutes twenty seconds.

Experiment 7.—A kitten was rendered quite insensible with twenty minims of nitrite of amyl. It kept mewing although quite insensible. Its respiration became very slow, and was performed in the following manner. A sudden inspiration followed by expiration, then it would stop breathing for a considerable time, when it would again make a sudden inspiration, etc. It died in five minutes from the time it became insensible. Before death, its nose and tongue were quite cyanosed.

POST MORTEM EXAMINATION, three hours after death.—The *lungs* were collapsed, floated in water, were more full of blood than normal; upon section, blood exuded from their cut surfaces.—*Heart*. All its cavities were filled with blood. The vena cava and the pulmonary vessels were distended with blood, while the aorta was empty. The blood in all the cavities of the heart was quite fluid and of a dark colour; upon exposure, it soon coagulated.—*Brain*. The vessels on its surface were full of blood; its cut surfaces were of a natural appearance to the naked eye and of a normal consistence.

Experiment 8.—A kitten, with a temperature of 100.8 degs. Fahr., was made insensible with nitrite of amyl. It having almost ceased breathing, the respiration was kept up artificially; its nose and the mucous membrane of its mouth were cyanosed, while the veins under its tongue were engorged with blood. It kept licking its lips with its tongue, and moving its forelegs, although quite insensible. It passed faeces and urine. When it was recovering, a very small quantity of chloroform was given it (inhalation), which, as it seemed to make it worse, was discontinued. After this kitten recovered sensibility, its temperature was so low that the clinical thermometer did not mark it. The amyl made the heart beat very rapidly, while it made its sounds very feeble.

Experiment 9.—Another kitten was also made insensible with nitrite of amyl. The results were similar to the above.

Experiments 10 and 11.—Two kittens got chloroform at the same time, when both were quite insensible, one got four minims of nitrite of amyl to inhale, and the other twenty minims. The first recovered consciousness in six minutes; the second (which inhaled twenty minims of nitrite of amyl) took twenty-five minutes to recover consciousness. In these two experiments, it will be observed, that a small dose of nitrite of amyl hastened the recovery from the chloroformic anaesthesia, whereas a large dose prolonged it. It is also well worth mentioning that, in the first kitten, the small quantity of amyl caused reddening of the nose and mouth; while, in the second, a larger quantity of amyl produced cyanosis of the nose and mouth.

From the above experiments, I beg to submit the following deductions.

1. Amyl-nitrite, when inhaled in small quantities, produces reddening of the face in man, and of the nose and mouth in kittens; this action is due, according to Brunton, to the dilatation and overfilling of the arterioles.

2. When inhaled by kittens in large quantities, it produces cyanosis of the nose and mouth along with insensibility. The cyanosis arises from overdistension of the venous system (experiment 7), this being due to the engorged arterioles propelling the blood into the veins, while the insensibility is probably caused by overdistension of the venous system and the heart.

3. When inhaled in small quantities, it produces recovery from chloroformic insensibility (see experiments 1, 2, 4, 5, and 6), by dilating the arterioles of the brain, and thus removing the cerebral anaemia due to the chloroform.

4. When inhaled in large quantities, instead of producing recovery from chloroformic insensibility, it not only retards it, but it may cause death by paralysis and overdistension of the heart, and engorgement of the venous system. *Vide* experiments 7, 10, and 11.

5. It causes a rise of temperature when inhaled in small quantities by the increased amount of blood in the arterioles causing an increased tissue change in the body (experiments 3 and 4).

6. In large doses (inhaled) it produces a fall of temperature (experiment 8).

7. It also helps to produce recovery from the chloroformic insensibility by raising the temperature which is always lowered by chloroform, and by removing the paralysis of the heart due to chloroform; this action is well seen by the nitrite of amyl making the heart's beat fewer and its sounds louder.

8. Death is caused chiefly by paralysis of the heart, which is shown by all its cavities being distended, and by engorgement of the venous system.*

CASE OF MALIGNANT CHOLERA TREATED BY NITRITE OF AMYL AND HYDRATE OF CHLORAL.

By EDWIN FAIRLAND, L.R.C.P.Ed., Staff-Surgeon, Lucknow.

PRIVATE J. C., 8th Royal Irish, confined in the Lucknow Military Prison, aged 36, in service fifteen years and nine months, in India one year and eight months, of bilious temperament, and of previous good health, was seized with an attack of malignant cholera at 9.45 A.M. on June 22nd, 1876. In the previous week, there had been two other cases of cholera in the prison, terminating fatally in seven hours each. Both cases were of the most malignant type.

He had suffered for two or three hours from slight faecal diarrhoea when the symptoms of cholera manifested themselves, and he was at once removed to hospital. The symptoms on admission were constant and severe purging of rice-water motions; very severe cramps in the abdomen and legs, the abdominal muscles being knotted up and feeling like a board under the hand; surface of the body cold and clammy; extremities very cold and livid in appearance; excessive thirst, accompanied by constant vomiting of watery fluid; facies cholericus strongly marked; conjunctivæ flattened; eyes sunken and a dark ring surrounding them; countenance livid and shrunken; breath and tongue cold; voice whispering. He was almost unconscious, being roused with difficulty; and apparently quite callous as to the result of his illness. The respirations were laboured. The pulse at the wrist was barely perceptible and thread-like. He complained of great heat of body, and preferred to lie quite naked. Six hours after admission, he passed about two quarts of rice-water motion. After being under treatment, a slight reaction commenced; the extremities becoming warmer and the pulse slightly fuller—98 per minute; but the cramps

* These experiments were made before the Vivisection Act came into operation.