

Clinical Lecture

ON

AORTIC INSUFFICIENCY.

Delivered at the Liverpool Royal Infirmary,

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PHYSICIAN TO THE INFIRMARY.

GENTLEMEN,—I wish to call your attention to-day to the case of James B—, whom you have recently seen in No. 10 ward, and to other cases of a like character which have been under my care, and to make them the subjects of some general remarks on that condition of the heart which we know as aortic insufficiency or incompetency, and which is attended by regurgitation through the aortic valves.

The man B— came to us when the disease was in an advanced stage, when serious secondary symptoms had supervened, and when nothing like permanent benefit from treatment could be hoped for. He was a fireman at some glass works, thirty-nine years of age, and was admitted on the 26th March last. I did not see him, however, in consequence of absence from home, till the 9th of April. The history he gave was very short. He had never suffered from rheumatism either acute or chronic, and had been able to do his work easily up to three months before his admission. At that time he first found his breathing difficult, and it gradually became worse. About a month before he came to us he noticed swelling of the legs. When admitted his urine was examined, and found free from albumen, and of specific gravity 1018. Thus you see that up to three months before he came here the man considered himself well.

On the 10th of April I examined him carefully. There was dropsy of the legs, arms, and abdomen. The breathing was short, catching, and panting. He was unable to lie down, and had to be propped up in bed. The pulse was 120, strong, sharp, and jerking. There was a single diastolic murmur over the base of the heart, at the lower end of the sternum, and in the course of the aorta. No murmur was heard at the apex and towards the left axilla. There was great pulmonary congestion. The patient had a troublesome cough, and was expectorating sputa somewhat rust-coloured, tenacious, and streaked with pure blood. The urine was scanty.

He had been treated with small doses of digitalis, blue-pill, and squills for a few days after admission, and subsequently with iron and a diuretic. He was taking his food well, but his nights were bad in consequence of the dyspnoea.

I ordered him two drachms of infusion of digitalis with ten minims of tincture of iron every two hours, and three ounces of brandy daily. On the following day he took the mixture every four hours, and subsequently every six hours. It was continued till the 17th. The pulse during this time kept at from 116 to 120; it was perfectly regular, and its character did not alter at all. The patient, however, rested better, passed more urine, had less cough, and the quantity of blood in the sputa diminished. On the 17th I omitted the medicine; but the next day the man was worse: there was more dyspnoea, the expectoration was more bloody, and blood had been passed from the bowels. I therefore repeated the mixture every six hours; little relief, however, was afforded. The appetite began to fail; the dropsy, slightly relieved by puncturing the feet, increased; the dyspnoea became more urgent. On the 20th the expectoration was decidedly bloody, and on the morning of the 23rd the patient died.

At the post-mortem examination we found patches of pulmonary apoplexy scattered throughout the lungs. The heart weighed twenty-six ounces. The right ventricle was much dilated and only very slightly hypertrophied; the pulmonary valves were healthy; the tricuspid orifice was

No. 2609.

large; the left ventricle was much dilated and largely hypertrophied; the mitral valve was healthy, the orifice large; the left auricle was dilated; the aortic valves were thickened but smooth, there were no growths on them, but, although large, they were incompetent to close the orifice; the aorta was dilated and atheromatous. The muscular tissue was rather pale, and, when examined under the microscope, the striæ were imperfectly marked, and there was decided evidence of fatty degeneration throughout.

Such were the features of this case, and it serves well to illustrate the general symptoms of aortic incompetency, and the morbid conditions which result from it.

The disease is one about which you ought never to make a mistake in diagnosis. Doubtless in the incipient stages of the affection a difficulty may exist; but when once the aortic valves have become really incompetent, the physical signs are so well marked that no mistake ought to be made.

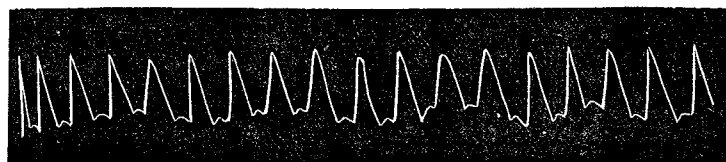
The murmur which characterises aortic regurgitation is *diastolic*. There may be, and there generally is, a double murmur, systolic and diastolic (for there is often aortic obstruction), but the latter is the result of the incompetency of the aortic valves, and is therefore the pathognomonic sign of that condition. The murmur is, generally speaking, audible at the base, upwards over the course of the aorta, at the second right costal cartilage, under the right clavicle, and at the lower end of the sternum. In some cases the murmur increases in intensity at the latter spot, whilst it diminishes in the upward direction; and again in other cases it is just the opposite, and has its maximum at the second right costal cartilage. The diastolic murmur lasts till the next ventricular systole, and therefore, if the heart is acting slowly, is very prolonged. In some instances it has quite a musical character, and is so loud that it may be heard at some distance from the body.

The pulse presents very characteristic features. Consider for a moment the condition of the heart, and you will at once understand the peculiarities of the pulse. After the ventricle has contracted and expelled its contents, a portion of the blood passes back into it during its dilatation. Thus, at the next contraction, the ventricle contains the blood it has received from the left auricle, plus that which has regurgitated from the aorta. This leads to a gradual dilatation of the ventricle, and as the disease progresses, and the aortic valves become more incompetent, so does the capacity of the ventricle increase. But this is not the only result. A process of a salutary and conservative nature goes on at the same time; the ventricle hypertrophies, its muscular walls increase in thickness, sometimes to an enormous extent, so that we find a heart occasionally weighing, as in the case of B—, twenty-six ounces; or, as in a patient who died under my care in the Northern Hospital, thirty-two ounces. The result of this hypertrophy is a powerful contraction of the ventricle on a larger quantity of blood than it contains in health, and hence the arteries are largely and forcibly filled. The pulse is therefore *full, jerking, splashing, visible*; the arteries rise rapidly under the finger, and then rapidly fall; there is a sudden collapse of the vessel, and this is the characteristic feature, as regards the pulse, of aortic regurgitation.

I show you some tracings of the pulse taken by the sphygmograph from patients suffering from this disease. They all present similar characters.

No. 1 was taken from the patient whose case I have related. At the time it was taken the pulse was 120, and getting weak; moreover, the instrument could not be fairly

No. 1.

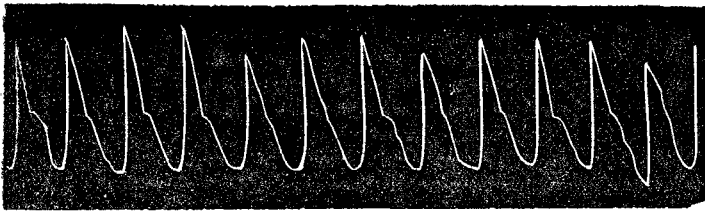


applied over the artery in consequence of œdema of the arm. The tracings are, however, quite characteristic, but not so high as in the others from the circumstances I have mentioned.

No. 2 was taken from Joseph D—, who was under my care in March, 1872, who had all the physical signs of aortic

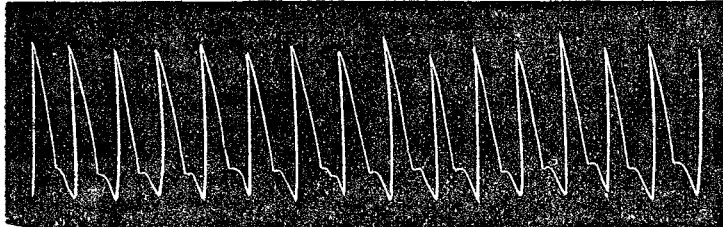
regurgitation, and in whom we found after death great incompetency of the aortic valves.

No. 2.



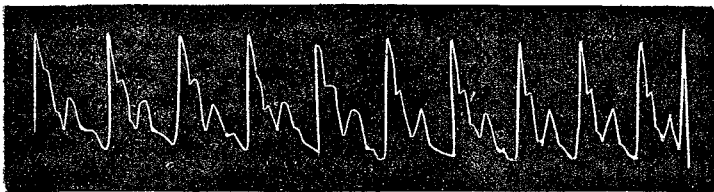
No. 3 was taken, about a fortnight before his death, from a patient to whom I shall refer hereafter, and who had had well-marked symptoms of the disease for at least eleven years.

No. 3.



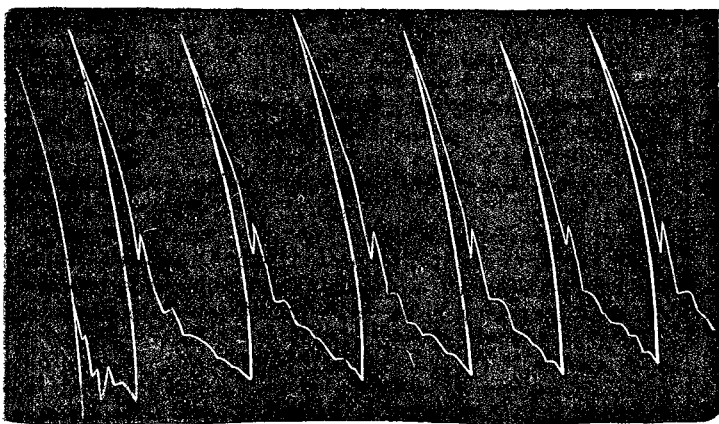
No. 4 was taken from Joseph O—, who was in No. 10 ward, and died in March of last year. We had the physical signs of both aortic and mitral regurgitation, but the aortic diastolic bruit was not very marked, and did not indicate much regurgitation. After death we found growths on the aortic valves preventing their perfect closure. The mitral valve was also incompetent.

No. 4.



No. 5. was taken from a patient under the care of Dr. Turnbull, who allowed me to have a tracing of the pulse. It is very remarkable as indicating enormous hypertrophy of the heart. The patient had a double murmur at the base, and was suffering from dropsy.

No. 5.



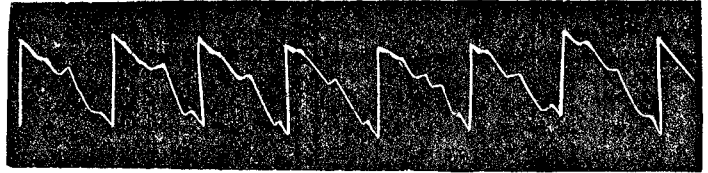
All these tracings were taken from the radial artery.

Although the sphygmograph does not give us any help in the diagnosis of this disease, it affords interesting confirmation of the opinion formed from other sources; and, moreover, by observing the manner in which the downward stroke of the tracing is formed, we are enabled to judge of the extent of the incompetency of the valves.

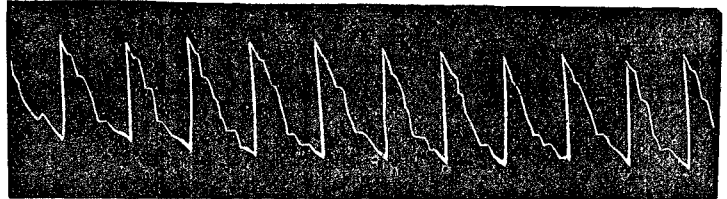
I show you the tracings of a patient who was under my observation for some years with well-marked symptoms of aortic regurgitation. No. 6 was taken in January, 1868; No. 7 on February 12th, 1870; and No. 8 on April 20th, 1871.

You will notice a difference in the character of the downward stroke, especially between the first and second tracings, showing, as the disease progressed, the more rapid collapse

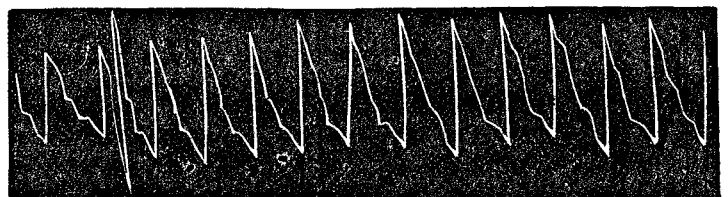
No. 6.



No. 7.



No. 8.



of the arteries. You will also notice the increasing frequency of the pulse—a circumstance which I shall call your attention to presently.

Dilatation and hypertrophy of the left ventricle are not the only changes which occur in the heart in this disease. There are others, and the first I will allude to are fatty or fibro-fatty degeneration of the muscular walls and the yielding of the mitral valve, giving rise to mitral regurgitation. The degeneration of the muscular fibres constitutes, in my opinion, the main element of danger in the disease. As long as the fibres retain their integrity and the ventricle retains its power, the circulation is well maintained; but as degeneration takes place, the ventricle becomes more yielding, is less able to empty itself completely at each systole, and embarrassment results. After a time, varying in different cases, the mitral valve yields, and we have the superadded condition of mitral regurgitation, and then follow enlargement of the left auricle, and those serious secondary symptoms in connexion with the lungs and general system which you have seen in the case of B—.

There is one other condition of the heart met with in this disease which the post-mortem examination of B— demonstrated—viz., dilatation of the right ventricle. This cavity was largely dilated, but there was very little thickening of its walls. This state of the right ventricle, following as a consequence of the mitral regurgitation and of the embarrassment of the pulmonary circulation, is intimately connected with the general dropsy which occurs in these cases, but to which I shall not further allude now.

Another consequence of simple aortic insufficiency is dilatation of the aorta, and it was well marked in our patient. This condition gives rise during life to certain physical signs. There is dulness on percussion extending from about the sternal end of the third right rib upwards to a little below the right sterno-clavicular joint. This indicates a dilated condition of the ascending portion of the arch of the aorta, but the dilatation sometimes extends along the transverse portion, and this may often be detected by pressing deeply down behind the upper part of the sternum. The pulsation of the artery may be felt here. The dilatation of the aorta is frequently accompanied, as in the case of B—, with atheromatous degeneration. The cause of the dilatation is very evident: the artery has yielded to the violent distension to which it has been subjected, and in the course of time its nutrition becomes impaired.

Let me now call your attention briefly to the morbid conditions of the lungs so frequently met with in advanced cases of this disease. The embarrassment to the circulation leads to extreme congestion of the pulmonary vessels,

œdema of the lungs, and bronchitic attacks; but not only this—pneumonia is by no means infrequently met with, and pulmonary apoplexy is very common. The occurrence of these conditions, especially of the latter, shows the fatal course which the disease is taking.

The pneumonia is usually of a passive kind, but occasionally, as in two of the cases I shall refer to, it assumes an acute character. The following is a well-marked instance of the latter form.

John C— was admitted into the Northern Hospital, under my care, on the 16th April, 1867, with all the symptoms of aortic regurgitation. He was relieved and discharged, and again admitted in January, 1868, and, after remaining a short time in the hospital, again discharged. Once more he came in under my care in January, 1870. At this time the urine was albuminous, and there was dropsy. He was discharged in July, and readmitted in November. Thus you see I had ample opportunities of watching the progress of his case. He was now suffering from general dropsy, and there was evidence of great hypertrophy of the heart. His general health, however, kept pretty good. He was treated with diuretics and iron, and the dropsy almost entirely disappeared. On the 12th April, 1871, he was seized with the symptoms of pneumonia of the right lung, and his condition became very critical. I treated him at first with carbonate of ammonia and brandy, but he did not improve; the dyspnoea became more urgent, and the pneumonic symptoms assumed a very severe character. On the 24th, after the pneumonia had lasted twelve days, he was in the following condition:—There was great heat of skin; he was expectorating tenacious bloody sputa, and there was dulness with other signs of consolidation over the whole of the back of the right lung. The pulse was 136, and the respiration very hurried. I ordered twenty minims of tincture of digitalis with camphor mixture every four hours, and I wish you to mark the result. I scarcely hoped for any improvement from treatment, considering the severity of his pneumonic attack, and the serious organic disease from which he was suffering. On the 25th the pulse had fallen to 130; on the following day it was lower, and on the 26th it was 100, and the man was greatly relieved. He had been somewhat delirious during the night, but all the severe symptoms were mitigated; the dyspnoea was less, the skin was perspiring, and the expectoration less bloody. The physical signs were about the same. Before I gave the digitalis I had been giving six ounces of brandy daily (which I continued), but no improvement had been produced. From the time, however, that the digitalis began fairly to act an improvement set in, and I think we must attribute to it the favourable issue of the case. The course of the patient subsequently was satisfactory. I stopped the digitalis on the 27th, when the pulse had dropped to 100, and simply continued the six ounces of brandy. On the 29th the pulse was 88; on the 1st May, 80; on the 6th there was scarcely any dulness at the back of the lung; and on the 9th the percussion and breath sounds were normal. The patient left the hospital on the 23rd May.

I will refer you to another case in which the pneumonia was of a milder form, but very difficult to get rid of.

I was consulted some months ago by a gentleman who had had for at least eleven years symptoms of aortic regurgitation. During all this time he had suffered little. He went about much as other people do. He had, from time to time, rheumatic and dyspeptic attacks, but these were soon relieved; and he suffered occasionally from palpitation. It was only a few months before I saw him for the pneumonia that he began to suffer much, and the first distressing symptom was dyspnoea coming on in the night. He found great relief from chloral, which he took in fifteen-grain doses. But after exposure one day in the spring, I was called to him, and found him suffering from inflammation of the left lung. The consolidation was not very marked, but there was dulness over about half the lung, and he was expectorating rust-coloured sputa. The pulse was quick, strong, jerking, and visible. There was evidence of great hypertrophy of the heart, and a diastolic murmur at the base. The urine was perfectly healthy, and there was no dropsy. I used mild counter-irritation, and gave carbonate of ammonia and subsequently iron. Under this treatment the dulness diminished, and the sputa became more natural; but soon the attacks of dyspnoea began to increase in severity. In the course of a few weeks the urine became

albuminous, and œdema of the lower limbs set in; this was followed by symptoms of pulmonary apoplexy; and within a week of this occurrence he died.

Here are the notes of another case in which the pneumonia proved directly fatal.

Samuel J—, aged thirty, a labourer, was admitted into the Northern Hospital under my care on June 27th, 1866. There was a well-marked systolic murmur over the base of the heart, and in the direction of the aorta; and, after he had been in a short time, the murmur became double, the diastolic, however, being very faint. The pulse was strong, regular, and visible. On Aug. 20th he complained of pain in the groin, and, on examination, the right femoral artery was found to be the seat of an embolus. He continued without much change till October 5th, when some dulness and crepitation were found at the base of the right lung, and rust-coloured expectoration followed on the 9th. The pneumonia gradually extended until it involved the whole of the back of the lung. At first he took digitalis in small doses, but no good resulted. Subsequently he took stimulants freely, but with no better result, and he died on Oct. 17th. The post-mortem examination revealed old-standing disease of both pleuræ, with very firm consolidation of the posterior part of the right lung, and a cretaceous deposit in the apex of the left. One of the aortic valves had the appearance of having been formerly ruptured, and in another calcareous matter was found. The mitral valve had a little pouch attached to it, enclosing fibrinous and calcareous matter. Fibrinous deposits were found in the right femoral artery.

Expectoration of blood, the result of pulmonary congestion, and *pulmonary apoplexy* are met with in this and in other valvular affections of the heart. I have elsewhere described the anatomical characters of pulmonary apoplexy, and I merely allude to it here as a clinical fact in connexion with aortic incompetency. Our patient B— suffered from it. It is not likely to occur until there is some yielding of the mitral valve; it is a symptom of very serious import, and generally indicates that the fatal termination of the disease is not far off. You may recognise its existence by the character of the expectoration.

Hæmorrhage from other parts besides the lungs is met with in these cardiac affections. Our patient B— had hæmorrhage from the bowels, and epistaxis is by no means uncommon.

You will have noticed that most of the cases of aortic regurgitation which have been in the wards have been free from *dropsy*. This symptom is often long delayed. It is only when the mitral valve has yielded that it occurs. Cases go on for many years entirely free from dropsical effusion, which may only appear within a few weeks of death. Œdema of the feet appears first, and gradually creeps up, involving at last the abdomen and even the chest.

I have mentioned the characteristics of the pulse in this affection—namely, that it is full, strong, regular, and jerking. It continues so generally to the end. Sometimes there are intermissions and slight irregularities, but not often. But there is one circumstance which I wish to call your attention to in connexion with the pulse—namely, *its gradually increasing frequency* as the disease progresses. For a long time in many cases the pulse remains moderately slow; but surely, if slowly, its frequency increases, and this shows, in my opinion, the increasing weakness of the muscular fibre, although the ventricular walls are hypertrophied. When the pulse in aortic incompetency reaches 120, and steadily continues at this uninfluenced by treatment, you may generally conclude that life will not be very prolonged.

There is but little suffering, speaking generally, in this affection, except towards its termination, when the dyspnoea becomes most distressing. For years patients will continue to go about, and, except that they have occasional attacks of palpitation, usually to be traced to some over-exertion or error of diet, they feel well; and indeed it is difficult to persuade them that there is much wrong with them. I have now a gentleman under my care who is twenty-one years of age, and has aortic regurgitation with well-marked hypertrophy, and I have the greatest difficulty in persuading him, so little does he suffer, that it is necessary to take care of himself, and to avoid all violent exercises. You know how often patients in the wards disregard our

injunctions to remain in the hospital for protracted rest, and leave us under the impression that they are well and able to resume their work.

Sooner or later in the course of this disease, unless the patient is cut off by sudden death, or some complication, the urine becomes albuminous. This condition is often delayed to a late period. It probably never occurs until the mitral valve gives way, and it is often coincident with the setting in of dropsy.

Now let me call your attention to the circumstances under which, as far as the history will guide us, the disease in our patient B—probably arose. This will lead to the consideration of some of the causes by which valvular affections of the heart are produced.

The man was a fireman at some glass-works and exposed to great heat, and doubtless his occupation was a laborious one and attended with great muscular exertion. There is no history of rheumatism, nor of any sudden injury to the valvular apparatus of the heart; nor did we find after death any deposits, either inflammatory or atheromatous, in the valves. They were somewhat thickened, it is true, but they were smooth, and apparently not diseased.

I think we are perhaps too apt to overlook the effects of strain on the heart—the influence which long-continued powerful action of the heart may have on its orifices, especially the aortic, and on its valves. We know well, from numerous instances which have been recorded, that sudden violent muscular efforts may rupture or injure the valves, and the prevalence of valvular disease amongst men who lead laborious lives—lives of long-sustained powerful muscular efforts—must strike all who have had experience in cardiac diseases. My belief is, that many cases of valvular disease are produced by the powerful action of the heart necessarily resulting from following certain occupations, and also from violent gymnastic exercises. In the case of B—, it appears to be highly probable that the aortic incompetency was the result of the dilatation of the aortic orifice and of the base of the aorta, from the distension to which they were subjected by the oft-recurring powerful action of the left ventricle. The symptoms in such a case would be slow in developing themselves. Dilatation must proceed to some extent before valvular insufficiency would result: this, at first, would be slight, but, once commenced, it would daily increase, and all the secondary consequences of the affection would ensue. I know how difficult it is to speak positively in reference to this question, but I have now seen several cases in which I could trace no other probable cause of valvular disease than that of strain from strong muscular exertion; and I have under my care at the present time a gentleman who is suffering from aortic regurgitation with symptoms of dilated aorta, which, I think, I can distinctly trace to the practice, some years ago, of gymnastic exercises.

I must defer what I have to say further on aortic insufficiency and its treatment to another lecture.

NOTES OF VISITS TO FOREIGN BATHS.

By JOHN MACPHERSON, M.D.

THE Kniebis BATHS.

There is an inexpressible feeling of quiet and repose and friendliness about the little cluster of baths known as the Kniebis group. They are easily reached by carriage from the railway station of Appenweier. In natural scenery and in mineral constituents they are all essentially the same. They are all in wooded valleys, and more than 1000 feet above the sea. Their waters are pretty strong chalybeates, containing small quantities of Glauber salts. The only exception to this is the quiet little Sulzbach in a side valley off the Rensch Thal, at a height of 1068 feet—not to be confounded with the place of the same name on the other side of the Rhine already mentioned. It is a little off the road to Petersthal, three-quarters of an hour from Oppenau. It supplies lukewarm waters of the temperature of 72.5°, containing about 6 grains of sulphate of soda and 4 of its bicarbonate, with little more than a trace of iron. They thus

closely resemble the waters of Bertrich, but are 20° cooler. The place is little visited; it offers a mild climate, quiet and simple amusement, and cheap living.

Without turning aside to this spot, I went on along the valley, and reached Freiersbach, 1281 feet, which is, indeed, practically a portion of Petersthal, being scarcely twenty minutes distant. Of the four springs I shall only say that the Gas one contains 10 grains of carbonate of lime, 4.5 of carbonate of magnesia, 6 grains of sulphate of soda, and nearly .4 of carbonate of iron, and is extremely pleasant to drink; while the Sulphur well, so called owing to the presence of a little sulphuretted hydrogen, is a very pure and strong chalybeate, containing .77 per cent. of iron.

There are prettily wooded banks and old-fashioned hotels, like barracks, containing the baths; also vapour and pine-extract baths. A new building has recently been erected over the Sulphur spring.

But Freiersbach is quite eclipsed by Petersthal, 1333 feet above the sea level, with its showier and more modern arrangements, its pretty and at the same time comfortable hotel, and all the ordinary appliances of a bath, which now numbers some 8000 annual visitors, among whom are many Russians.

The three springs here are all essentially the same, and characterised by the presence of an immense supply of carbonic acid. The Peters, the Salt, and the Sophia wells all contain about 11 gr. of carbonate of lime, 3.5 gr. of carbonate of magnesia, and about 6 gr. of sulphate of soda, with .34 gr. of carbonate of iron. The different action of the springs is thus characterised: the Petersquelle is supposed to suit weak digestion best; the Saltzquelle, having a grain and a half more of magnesia, acts most on the intestines; and the Sophiawelle, containing .111 gr. of carbonate of lithia, is declared to be especially useful in affections of the bladder and kidneys.

Though the waters are used mostly for drinking, they are also employed for baths; and you may have sitz baths and douches, and the *wellen* or wave baths of which the Germans are so fond, in the stream of the Renche.

Seeing Petersthal as I did in beautiful weather, it appeared to me a very attractive spot. Its waters and, indeed, those of Freiersbach are largely exported. The Peterswell is the pleasantest to drink, and is most bottled.

Going up the valley to Griesbach, which is only four miles distant, one passes on the left the road leading to Antogast, the oldest of all these baths; it was described in 1538. Indeed, all the Kniebis baths were quite as well known in the end of the sixteenth and the beginning of the seventeenth centuries as they are now. Antogast lies at a height of 1610 feet above the sea level. Its waters differ from the neighbouring ones in containing a few grains of carbonate of soda, and less carbonate of lime, also less iron. It is said to be a quiet, picturesque place, but is little frequented, and the arrangements are not of the first class.

We soon reach Griesbach (1614 feet), which has of late become extremely popular. As there are only the public establishments, it is often difficult to get accommodation here. A new bath-house has lately been erected. Everything looked fresh and new and comfortable, and the neighbourhood is very pretty; gardens and walks have been laid out. The waters of Griesbach contain less carbonic acid than those of Petersthal, which is a disadvantage as regards bathing. But the drinking-well, with .6 of carbonate of iron, is quite strong enough, and contains more carbonic acid, but its proportion of carbonate of lime (12.2) is rather high. There are arrangements here for pine extract baths and inhalations. Griesbach is a very favourite bath for ladies. It is quieter than Petersthal. I have known an English family go there for several successive seasons.

Immediately beyond Griesbach, the road over the Kniebis commences to ascend in a series of zig-zags, from which there are beautiful views over the Black Forest. The top of the Kniebis is flat and uninteresting. The road soon takes us down into the Kinzig valley on Rippoldsau—on the whole, the most important, as it is the most picturesque and the highest of the group, situated in pine forests at an elevation of 1886 feet.

Rippoldsau lies in a narrow valley among hills covered with fir woods, which yield the aroma so grateful to most lungs. In the middle of September, when the bath establishment was just closing, the air had a feeling of great