pathology of valvular diseases, nor what we know of their clinical history, will allow us to set up absolute rules of judging what will be their consequences and events in all cases, or how far they can or cannot be postponed. (*Op. cit.*, p. 239.)

We may also take heed to the wisdom of Stokes as expressed in the following passage: "The practitioner should never forget that local diseases, themselves incurable, may co-exist with an excellent state of the health for a period indefinitely long." Inasmuch as we may now fairly claim to approach the study of heart-valve disease with fuller physiological knowledge, and more exact diagnostic method, than were available either in Latham's or Stokes's time, we may not unnaturally expect to begin a new, and, I would submit, a more hopeful chapter of prognostics in relation to it. To all, then, who will aid in this inquiry, I say "*Ausculata et perpende.*"

AN ADDRESS

ON

WORTHING: ITS CLIMATIC AND SANITARY CONDITIONS.

Delivered at the Annual Meeting of the South-Eastern Branch,

By WILLIAM J. HARRIS, M.R.C.S. Eng.,

Senior Medical Officer to the Worthing Infirmary: President of the Branch.

My few remarks will be principally confined to the rise and progress of this town, more especially since it came under the Public Health Act in 1853, giving you a short statement of its geology, meteorology, and climatology, together with an account of the drainage and water-supply, remarks on certain epidemics which have occurred, and also mentioning the benefits through which the place and neighbourhood seem to be of service to those who sojourn here either for pleasure or for health.

Aspect.—The town of Worthing is situated in latitude 50.49° N., and longitude 0.22° W. The situation of the town is as due south as possible, fully exposed to the direct rays of the sun; its height above the mean sea-level being but a very few feet. The South Downs, being somewhat about two miles to the north of the town, and running from east to west in a somewhat curved form, rising, too, to a height of from four to six hundred feet above the sea, tend to shelter the place considerably from the north and north-east winds. The plateau, too, upon which the town and the surrounding neighbourhood is situated, is really never hot in summer-time as many other places are; for, owing to the receding tide, a vast amount of evaporation takes place, and consequently a "sea-breeze" is developed every day, and possibly when least expected. This is usually quite local, and sometimes does not extend a mile or so inland.

Geology.—The ground upon which Worthing and other places along the coast westward of Brighton are built, is of recent formation, being composed of gravels, sands, and loam belonging to the post-pleistocene series. This portion of the county, called the "Sussex Levels," is distinguished by low cliffs and broad estuaries. The lower strata of land and sand, known as the "Woolwich Beds," is topped by the "chalk," which rises gradually into hills, known locally as the "Downs," and especially prominent in this neighbourhood is Chanctonbury Ring, rising 814 feet above sea-level, about six miles north, and Cissbury, three miles north, 600 feet above the sea. Upon digging wells here, good water has been procured at from eighteen to twenty-five feet. There is found from four to ten feet of surface-soil, containing from two to three feet of good mould; the rest is loamy brick-earth, mixed more or less with rolled flint-stones. This may be the remains of an old beach, but no shells are found. Beneath this stratum lies the "marl," consisting of broken chalk and flints, in which water is found; but in most cases it is necessary to penetrate about seven or eight feet in order to get a proper supply.

Meteorology.—A complete series of meteorological observations have been recorded here for the last thirty-three years. The late Dr. Barker's records comprise the fifteen years 1853-1867, and my own for the following eighteen years 1868-1885. I am sorry to say that, during a portion of that period, the records have not been fully worked out, namely, 1875-1879 inclusive, but the mean atmospheric pressures and the mean temperatures which have been deduced by Mr. Buchan, of the Scottish Meteorological Society, for the eighteen years 1857-74—

calculated on twenty-four years ending 1880—are sufficient at present for comparison with all the stations in the United Kingdom which are given in his tables ending 1880.

With the year 1880, however, the Royal Meteorological Society started their series of "Climatological Stations," the number of which, at the commencement of this year, was fifty-six. There is no doubt that, in the course of time, this series of stations will prove a valuable means for obtaining information as regards the climatic condition of towns and their surrounding neighbourhoods. In this branch I should like to see a few more stations, especially along the coast. Taking the map of the three counties, I find that Margate, Ramsgate, Tunbridge, Tunbridge Wells, Norwood, Addiscombe, Beddington, St Leonards, and Worthing, are on the list. Eastbourne and Brighton report through the Registrar-General, and Dungeness—which has taken the place of Dover—is in direct telegraphic communication with the Meteorological Office.

The following are the mean readings of various instruments for a series of years; and for comparison sake I will take Bournemouth—4 or, as I believe, now Southbourne-on-Sea—where the observations have been more recently recorded by Dr. Compton. The mean yearly reading of the barometer reduced to 32 degrees at sea-level for eighteen years, 1857-74, and calculated on the mean of the twenty-four years ending 1880, is 29.972 inches. The mean yearly reading of the thermometer in the shade for the same period, and calculated at the same ratio, is 50.5; that at Southbourne is 50.1, at Bournemouth 50.3; and at Hastings 49.9. The mean annual rainfall for twenty-four years 1860-83 was 29.05 inches; that at Hastings for the same period 29.01 inches. For twenty years 1866-1885, as recorded by myself, the mean annual fall was 28.20 inches.

For determining the climate of any locality, the highest, lowest, and mean temperature must be ascertained, and the observations carried on for a considerable number of years. The relative humidity, the total rainfall, and number of wet days, together with the range of temperature, all have to be taken into consideration. The influence of ozone, as well, acts as a great factor, as, in its oxydising effects, it is a strong disinfectant of the atmosphere. On this coast, it is always fully and freely developed, especially with the winds off the sea, and principally from the south-west.

Drainage and Water-supply.—A new and complete system of drainage was commenced and carried out in the years 1854-55, after the town came under the Public Health Act. It was found, after some years, that this system had its defects, inasmuch as all the sewage gravitated to the north-east part of the town into a "sumpt" and a so-called sewage-well. From this well its contents were duly pumped into an out-fall sewer, which emptied itself into the sea about one and a half miles eastward of the town, just below the beach, and was left to be washed away by a stream of water emptying itself there as well.

About the year 1875 or 1876, it was determined by the Local Board that a new plan should be adopted, and this was finally brought into operation in the year 1877. It consists as follows. The whole of the drainage of the district finds its way to the north-east part of the town by gravitation. Thence it is conveyed by a new sewer across the park and through the brooklands direct to the sea for about a mile and two-thirds, passing through the beach in cast iron pipes down to low water mark of ordinary spring-tides. This main outlet sewer will retain the whole of the sewage between the tides, with the exception of storm waters; but such overflow is allowed for by three-eighths inch pipes being placed to discharge the same into the brooks. This main outlet sewer is three feet six inches in diameter, and on it there are fourteen surface ventilators, varying from twelve to eighteen inches in diameter. Throughout the town in the various tributary sewers there are seventy-six ventilators on the surface of the streets—one eighteen-inch stack, one twelve-inch, and one six-inch, in connection with, and emptying into the chimney stack at the Works, and in various portions of the town there are twenty-six six-inch ventilating pipes up the sides and gables of houses, and other suitable positions. All new houses, and most of the old ones, now have their soil-pipes properly ventilated, and, as there is no trap at the bottom of any of them, a more free exit is given for the escape of gas from the sewer. In all houses, too, both the scullery, bath, and waste-pipes are totally disconnected from the drains.

The main sewer is regularly flushed at spring-tides by the sewage being penned up until low water by the "penstock" at the outlet being closed, and then quickly opened; the tributary sewers are regularly flushed by the flushing valves being worked in a similar way as the "penstock," and always at low water.

All closets now (and also most of the old ones) are provided with a distinct flushing apparatus, consisting of a "vacuum" water-waste

preventor applied to a "flush-out" closet after Doulton's plan, or National, or such like.

Water-supply.—This is obtained from the chalk through artesian wells of which there are two, one 70 feet deep, with a bore of 295 feet, and the other 100 feet deep, with a bore of between 300 and 400 feet. These wells were pumped for some years separately, and the water was lifted up into a large tank situated on the top of a tower over 100 feet high, and then distributed to the town at constant pressure. In the year 1880, a tunnel, 75 feet from the surface, was driven between the two wells, and the yield from both wells gave a supply equal to 12,000 gallons per hour. Owing, however, to the increase of the district, and the great drain upon the supply, irrespective of the waste which was continually going on, it was resolved, in the early part of 1885, to sink another well to the north-east, and run a tunnel from that point to the present one, and the result has justified the anticipations of the board. The yield now given is 20,000 gallons per hour from the tunnels and wells, and, instead of pumping both day and night, as used to be the case, 14 to 15 hours in the 24 at the outside, are all that is required. The quantity, too, per head has been reduced from 37 gallons to 22, owing to the waste having been detected and stopped, both by means of water-waste preventors to closets, and a proper supervision of all taps and fittings. The following is the analysis: The water is clear, inodorous, and of a pale greenish brown: it shows all the characteristics of a pure deep well water, and although somewhat hard, it is not too hard for drinking; it constitutes, in fact, a high class drinking-water. For general domestic purposes it would, however, be improved by softening. Appearance, clear; colour, very faintly greenish brown; smell, inodorous; deposit, very minute trace; nitrous acid, none; phosphoric acid, a trace; poisonous metals, none; hardness before boiling, 20° (Clark); oxygen absorbed from permanganate, 0.011 grains per gallon; total dry residue, 28.28 grains per gallon; colour of residue, very faintly yellowish; behaviour of on ignition, no blackening; chlorine (as chloride), 3.01 grains per gallon; nitric acid (as nitrate), 2.01 grains per gallon; ammonia, 0.0045 grains per gallon; albuminoid ammonia, 0.0000.

The Town Works and their Cost, 1853 to 1886.—With reference to the cost and outlay upon the various works just described, and which have been carried out since the adoption of the Public Health Act in 1853, it may be of interest to know the amount which has been expended upon the principal and permanent works. They are as follows: water-supply, £29,643 (1854-86); sewers, £25,346 (1855-86); sea-defences, £31,691 (1867-86); parade, £1,563 (1886); park, £1,353 (1880-86); sundry works, land improvements, plans, engineers' charges, etc., £5,728 (1853-86); giving a total of £95,324 paid out of Capital and Revenue Account. This may appear a large sum; but, spread over the period of thirty-three years, it averages an expenditure of about £2,890 *per annum*.

With the exception of the sea-defences, we can show a good deal for the money expended; but, unfortunately, this being an "eroding coast," the sea had no mercy on us for many years. Happily, now the whole system of sea-defences is in complete order, and, after a variety of trials and experiments in groyning—for they literally have been experiments—I believe now we have found out, for this identical part of the south coast, a system of groyning, which has given us the beach and sea frontage which we now possess. It has taken some seven or eight years to perfect it, and if the authorities, in the future, will only keep up the present system, I have every reason to believe the town will not suffer from the inundations which it was periodically liable to in years gone by. As a finish to the beach, the local authorities last year resolved on the laying down of an asphalt or tar-paving, from one end to the other of the parade, which has proved one of the most beneficial and useful improvements ever undertaken. Together with the erection of the shelter-sheds, visitors and invalids concur in their comfort being cared for. I am glad to say that the neighbouring district of West Worthing has this year followed our example in the prolongation of the asphalt in their district, and by the erection of two most convenient shelter-seats.

The park, too, at the north-east part of the town, was commenced in 1880, and, though some opposition was expressed against its formation in the first instance, yet all hostility soon ceased, and this last year an addition was made to it, which will prove eventually of great advantage to the neighbourhood where it is situated.

Public Mortuary.—The Local Board have, in the last few months, had erected on their grounds a special mortuary for the town, so much trouble having been caused at various times by bodies being cast up on the shore, and the difficulty being where to deposit them. The great trouble was where to find a site, as of course many objections were made to such a building being situated in a public street, or con-

tiguous to other buildings. The total cost, I believe, was about £120, and will, I think, prove money well laid out.

Infirmary.—A new Infirmary, too, was commenced in 1886, and opened in the autumn of 1881. There we have a building built on an uniform plan, with all the offices and wards upon the ground-floor, situated in a large open space of ground directly south of the park, and with no chance of possibly ever being enclosed or blocked up by buildings on either side of it, or even due south of it. It is furnished with twenty beds and four cots, consisting of a male and female ward, a children's ward, accident and special wards, together with a good operating-room, and proper accommodation for out-patients. The staff consists of three honorary medical officers, a sister and nurses, dispenser, and the usual house accommodation. A proper mortuary exists, too, in the grounds of the institution.

Population.—For the census of 1881, 11,000 was the return over an area of 980 acres; at the present time, it is computed the population equals 12,000.

Mortality.—Since the reports issued annually by the medical officer of health, Dr. Kelly, the mean rate of mortality for ten years, 1875-84, has been 16.0 per 1,000 inclusive of visitors, and 14.5 exclusive of the same, and during that period the lowest rates have been 13.4 in 1883, and 12.4 in 1882 respectively.

Disease and Epidemics.—During the past twenty-five years in which I have been in practice here, the town unfortunately has suffered from various zymotic diseases, and of an epidemic form. To my knowledge small-pox broke out virulently in 1863, and again a few years later, and in both outbreaks the original cases were imported.

Scarlatina, too, used to be frequent, but of late years, except when imported by accident, no great trouble has been experienced in stamping it out.

From enteric fever we have suffered severely. The first outbreak occurred in the autumn of 1865, consequent upon a very heavy rainfall in October, whereby the drains being surcharged, and there being no proper outlet for the escape of the pent-up gas except through the street-ventilation on surface of ground, all houses in the higher parts of the town, together with many others besides, became impregnated with sewer gas, and thereby set up the origin of the fever. A lull occurred when the cold weather came on, at the end of December and during January; but, in February, 1866, a fresh recurrence of the fever occurred, and it was some weeks before the town was quite free from the disease. For some years, owing to the needful precautions taken, and a more general system of ventilation being adopted, the cause of enteric fever gradually subsided, though now and then sporadic cases cropped up. But, in the late summer and early autumn of 1880, another very curious outbreak occurred.

In the first instance, in the early part of September, the outbreak was due to sewer-gas and defective drainage, consequent upon the effect of a heavy rainfall (1.45 inch in rather more than an hour), and localised principally in one street at the western end of the town, when it turned out, upon careful examination, that there was no proper ventilation to relieve the closets, and where, too, the sink-pipes were found in direct communication with the drains, and placed within the houses. In the second instance, however, in the autumn of 1880, another outbreak occurred in various parts of the town, quite unconnected with the earlier one. Neither the drainage nor the water-supply of the various houses or tenements implicated could be found to be the *fons et origo mali*. The question of the milk-supply was then gone into, and after a most thorough and careful investigation by the committee appointed by the local board, together with the assistance of the medical officer of health for the district, Dr. Kelly, it was discovered that one dairy in particular used to pump from a certain well, drawing water therefrom for washing out the cans, and it was found, on examination, that there was a soakage through a defective drain into the well. The well was a shallow one, about 22 feet deep, situated in an old part of the town, and it turned out eventually there had been cases of enteric fever in the house adjoining, which had the joint use of the well. The whole of this outbreak was most elaborately worked out and fully reported upon by Dr. Kelly, which was duly published and issued in 1880.

I may mention, perhaps, that, within the last seven years, and more especially since the outbreak of 1880, the local board have made all efforts and endeavours to ward off any such outbreak again. Every house now built is duly ventilated, all closets have the flush-out and water-waste preventive system duly applied, and every endeavour is made when the opportunity occurs to run up 6-inch shafts to the tops of the highest houses and at the closed ends of the sewers. These are all properly and frequently flushed.

Measles and whooping-cough, of course, we must expect to suffer from at certain intervals; and, unfortunately, during the past winter,

these two diseases were very severe and fatal amongst a certain portion of the population.

Acute articular rheumatism is rare, and no cases of malaria are met with, as a rule, though, in days gone by, the neighbourhood of Lancing gave us cases of ague in its various forms.

The Benefit of the Place for Invalids.—There is no doubt in my own mind that the climate of Worthing is most fitted for those people somewhat advanced in years, who desire rest and an easy means of getting about. For children, too, of all ages up to puberty, the place is very well suited. Its free and open exposure to the rays of the sun; the soft balmy air from the sea, accompanied with a large and frequent supply of ozone; and the evaporation when the tide is out, thereby cooling the heated air of the summer, and tending to bring about a fresh breeze always some time throughout the day—all these are favourable for its position as a health-resort. Its perfectly level situation tends to recommend it to all those suffering from heart-disease; and the atmosphere appears to agree with most cases of chronic bronchitis and some cases of asthma. In the latter stage of phthisis, the atmosphere has a beneficial and soothing tendency; but, in the earlier stages, the climate, in my opinion, is too moist and relaxing. Cases, too, of whooping-cough do well here, especially if brought down in the later stage. Chronic rheumatism, and those suffering from chronic rheumatic arthritis, derive benefit as well by being able to be fairly exposed to the influences of the sea-air, and enabled thereby to take passive exercise in this free and open sunshine.

ILLUSTRATIONS OF EXCEPTIONAL SYMPTOMS AND EXAMPLES OF RARE FORMS OF DISEASE.

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(Continued from page 1212 of last volume.)

XIV. RECOVERY FROM ASCITES, AFTER PARACENTESIS, IN A YOUNG MAN, THE SUBJECT OF DISEASE OF THE LIVER: GOOD HEALTH SEVENTEEN YEARS AFTERWARDS.

I SAW, with Mr. Alfred Kennedy, at West Ham, in May, 1884, a case of very considerable interest in reference to prognosis. Our patient was a man, named G., now aged 35. The reason for my seeing him was that he had been recently injured in a railway accident, but the interest of his case belongs wholly to his former history. Seventeen years ago, when he was 18, he had a long illness which, he said, was diagnosed as "ascites, pleurisy, and diseased heart and liver." He was treated in St. Thomas's Hospital, under the care of Dr. Bristowe. Some scars under the umbilicus confirmed his statement that he was tapped more than once for ascites. The left side of his chest was decidedly contracted. Both legs were covered by dusky stains, as if he had formerly suffered from thrombotic purpura. His heart's action was very irregular. I could not detect any *bruit*, and there was no proof of hypertrophy, but the action was peculiar and jerky, possibly from adherent pericardium. I was told that, on some occasions, a murmur had been detected. His liver was still very much enlarged, its edge, thickened and bossy, could be very easily felt two inches below the ribs; it appeared to be equally enlarged in all parts. The man told us that he had enjoyed excellent health, in spite of the conditions mentioned, ever since his discharge from St. Thomas's Hospital. He had never had any return of the ascites or oedema of the legs. He had led an active life, and had only suffered from a little shortness of breath and palpitation, after making unusual exertion. He had been married for six years; he looked fairly healthy, but not robust. Since the railway accident, he had suffered from palpitation, with a tendency to faintness and to hysteria. There did not appear to be any definite explanation of his former illness, for he alleged that he had always led a temperate life.

Having forwarded the above narrative to my friend Dr. Bristowe, he was so very kind as to refer to the hospital records, write out the following notes, and permit their publication.

Dr. Bristowe's Notes.—"G. G., aged 20, came under my care in St. Thomas's Hospital, November 11th, 1869. The history he gave was to the effect that, two years previously, he had been laid up for three months in University College Hospital with pleurisy, from which he had recovered; that, three months later (eighteen months ago), he began to complain of swelling and tenderness in the epigastric region, and that, from that time, he had been gradually enlarging in the abdomen. He continued at work up to three weeks ago.

"On admission, he was pale and thin. The abdomen was large, containing so much fluid that only a very small area of resonance existed in front. There was no tenderness, and no definite enlargement of liver or tumour to be detected. The left side of the chest was much contracted, measuring, at the nipple-line, only 16½ inches in circumference (the right measuring 19). It was dull in its lower half, and the breath-sounds were feeble or absent; no cough; no signs of progressive disease; urine free from albumen; legs oedematous. In other respects he was healthy. The abdomen slowly increased in circumference (at level of navel) from 38 inches to 41, and, on January 6th, two months after admission, twenty-three pints of fluid were removed by paracentesis. He was relieved, but slowly refilled, until, on March 7th, twenty pints were removed. After this, he appeared to be filling again slowly, and he left the hospital on April 11th, still presenting some ascites; but his general health seemed good.

"I have no record of his occupation, or of his habits, or of any statement with respect to syphilis; and I never detected clear evidence of disease of the liver. I have not recorded my diagnosis; but I suspect that I attributed his affections, first, effusion into the pleura, and then ascites, to tuberculosis. During the greater part of his residence in hospital, he was treated with quinine and iron. There was no disease of the heart."

XV. SIMULATION OF BRACHIOPLEGIA BY RHEUMATISM.

When the patient to whose case the following statements refer entered my room, with his head bent forwards and his arms held stiffly by his sides, I certainly thought, as he did, that it was a case of incomplete paralysis of the upper extremities, probably consequent on an injury to the cervical spine; and it will be seen that the history which he gave was one which quite fitted with such a diagnosis. He said that his arms were powerless immediately after a fall from a swing, and that they had remained so ever since. On careful examination, however, I came to the conclusion that nothing had happened, excepting a severe contusion of the neck and shoulders, causing pain in motion, and that the enforced rest, subsequently, had induced rheumatic stiffening of both shoulder-joints. On careful inquiry, it appeared that at no time had there been any sensory paralysis. There had never been any numbness in the limbs, or "pins and needles." Although all the muscles were wasted and thin, none were especially so, excepting the deltoids. He could move all the joints of his forearms, hands, and fingers quite well. The deltoids were so wasted, that all the bony prominences were easily seen. Both shoulders were stiff, permitting only the very slightest degree of motion; in both, there had been much aching, especially about the insertion of the deltoid, as usual in cases of rheumatic disease of the joint.

I inquired whether there was any tendency to rheumatic gout in his family, and found that his father had had gout, and that he himself had suffered from lumbago. From the manner in which he held his head stiffly forwards, and from his complaint of pain in the back of the neck and shoulders, it seemed probable that rheumatic changes were in progress in the joints of the vertebrae, tending to the production of spondylitis deformans. It is possible that he may have had some fracture of the laminae; but, whether this occurred or not, it is clear that there were never any real indications of injury to nerves. After the fall, he had much pain in his neck, and could not use his arms. He could walk, and was able to ride home, and walked upstairs, holding his arms across his chest and his head bent forwards. He was nearly two months in bed after the accident, with pain in the neck and arms. During that time, he lay almost constantly on his back in one position.

XVI. NEURALGIA OF THE SCALE, PROBABLY OF GOUTY ORIGIN: DETAILED DESCRIPTION OF THE PAIN.

A gentleman, possessed of some anatomical knowledge, and almost hypochondriacal in his tendency to self-observation, described to me the following symptoms. Early in the morning of March 2nd, he experienced over the middle of his left parietal bone a sharp explosion of lightning-like pain. It began exactly in the middle, and passed forwards nearly to the forehead, and backwards nearly to the occiput, being most intense in the centre. It radiated a little laterally, but not nearly so far as it went backwards and forwards, and it never crossed

¹ The notes, from which I quote, are in my own handwriting, and I believe that the absence of reference to these points means that I elicited nothing worthy of record, or that seemed to throw light on the nature of his case. My notes are difficult to read. On looking through them again, I find that, after each tapping, I examined the abdomen; that, after the first, I did not recognise hepatic enlargement; but that, after the second, I remarked that there was dullness for two inches below the right ribs, and that, in the scrobiculus, there was a distinct hard edge feeling like that of liver, but moving with the abdominal walls.—J. S. B.