1,500,000 gallons, or 21.71 gallons per head per day. The reason for the reservoir of 51,000,000 gallons mentioned above and the smaller reservoirs will be apparent when it is remembered that dry seasons sometimes come two or three together. The consumption per head, 21.71 gallons per day, includes water used for trade purposes. The writer understands that the average consumption for domestic purposes is about 20 gallons per head per day. Bath is not a manufacturing town, though there are a few manufacturers in it, and, therefore, the trade consumption is small, the only trade consumption of any consequence being for hydraulic lifts, of which there are fairly large numbers, considering the size of the town.

The writer is indebted to Mr. Jules Dent Young, the waterworks engineer of Bath, for the information with reference to the Bath supply.

One point that may be noted with reference to the Bath water supply is, it is very hard. Naturally, its passage over the limestone formation brings this about. No filters are employed, the earth through which the springs percolate acting as filters, and very efficient ones.

Cardiff Waterworks.

The development of the waterworks supplying Cardiff and the district is exceedingly interesting. For a number of years Cardiff grew almost as quickly as so many Canadian and American towns have. From the time when it was discovered that the coal in the Welsh hills had such a high commercial value, the expansion of the town went on by leaps and bounds. Every census found its population at least doubled. The coal within a certain radius of Cardiff was quickly leased on royalty, and, as a large portion of the mineral rites belonged to the Marquis of Bute, who was largely instrumental in the development of Cardiff itself, there was a clause in all the mineral leases issued by the Bute estate office, obliging the lessees to ship a certain proportion of their coal at Cardiff. The Cardiff docks were the earliest of any consequence in the district, and they were added to gradually from time to time, and their existence also tended to draw the coal from the other collieries, of which the Marquis of Bute was not the lessor, and hence the development of Cardiff. In the early days of Cardiff the water was obtained very largely from springs. The successive Acts of Parliament which were obtained by the Cardiff Corporation and the company which floated them enumerate the acquisition of the right to impound the water of the different rivers emptying themselves at Cardiff and of a large number of streams, springs, etc., which found their way into the rivers. The springs from which the early supply was obtained were in the neighborhood of the River Ely, and the supply was obtained by building culverts of brickwork, with open joints on the top and sides, through which the water percolated into the culverts from the springs and from the natural drainage of the ground. The water ran through the culverts into a pump well, from which it was pumped to a reservoir a little above the town, from which again it supplied the town by gravitation. These springs are still available for the supply of the town if required, and they furnish about 1,500,000 gallons per day in wet weather and 800,000 gallons per day in very dry weather. The water from these springs, however, is very hard. Later on, as the town extended, reservoirs were constructed a little farther out and at a little bit higher elevation, and this went on for some years, unil it being apparent that the extension of the town might go on almost indefinitely, and it being also apparent that other towns in the Midlands and elsewhere were looking to the Welsh mountains for possible supplies of water, it was determined by the Cardiff Corporation to secure Parliamentary powers, giving them a sufficient supply for practically all time. For that purpose powers were taken to construct three reservoirs, one above the other, in the neighborhood of what are known as the Brecon Brecons, and in the area from which the principal rivers draining Glamorganshire and Monmouthshire take their rise. The upper reservoir is thirty-five miles distant from Cardiff, and the fall is such that if the balancing reservoirs mentioned below were not supplied the

pressure at which the water would arrive in Cardiff would be very high. The highest is the Beacons reservoir, which has a capacity of 345,000,000 gallons, the top water area being nearly fifty-two acres, and the top water level being 1,340 feet above Ordnance Datum. The depth of water in the reservoir when full is fifty-two feet.

The second reservoir, known as the Cantreff, has a capacity of 323,000,000 gallons, its top water area measures forty-four acres, and the top water level is 1,073 feet above Ordnance Datum, and the depth of water when full is seventy-three feet.

The third reservoir, which has not yet been constructed, but for which powers have been obtained, will have a capacity of 906,000,000 gallons; its top water area will cover one hundred acres; the top water level will be 840 feet above Ordnance Datum, and the depth when full will be sixty-five feet.

It is, perhaps, interesting 'to note that it was found impossible to construct the Cantreff reservoir, the first of the three to be taken in hand by contract. Two contractors failed to complete, and it was finally constructed under the direct supervision of the engineer, the total time occupied being six and a half years. The Beacons reservoir, the second to be carried out, was constructed under the direct supervision of the engineer, and it occupied about four years in construction.

The Corporation of Cardiff have to allow 7,750,000 gallons per day compensation water to riparian owners and tenants on the River Taff and its numerous tributaries. The water from the three upper reservoirs is delivered to the reservoir at Llanishen, which is just outside, and practically a suburb of Cardiff, by conduits, with balancing reservoirs, to be described below, on the way. There are three balancing reservoirs, as they are called, roughly dividing the fall between the Cantreff reservoir and the Llanishen reservoir into four sections. The balancing reservoirs have a capacity of 500,000 gallons, and the top water levels are respectively 782 feet, 505 feet and 330 feet above Ordnance Datum. The delivery pipe from the Cantreff reservoir to the first balancing reservoir is 24 inches in diameter, from there to the last balancing reservoir it is 29 inches in diameter, and from the lowest balancing reservoir to the Llanishen reservoir, the reservoir supplying the city and district, it is 24 inches again. The pipes were designed for a capacity of 12,000,000 gallons per day, but owing to incrustation they will now only deliver 9,000,000 gallons per day. There are the usual scour pipes, air valves, regulating valves at different points.

The arrangement of the balancing reservoirs is as follows: The water runs from Cantreff reservoir into the first balancing reservoirs at Cefn. When Cefn reservoir is full, the water runs from it to the second reservoir, Blackbrook. When Blackbrook reservoir is full, the water runs from it to the third reservoir, Rhubina, and when Rhubina is full, the water runs into the Llanishen reservoir.

The Llanishen Reservoir.

As mentioned above, the Llanishen reservoir is just outside of the city of Cardiff, in the village of Llanishen, which is now practically a residential suburb of Cardiff, though not included within the city boundaries proper. The capacity of the Llanishen reservoir is 317,000,000 gallons, its top water area being nearly sixty acres. Water is delivered from the Llanishen reservoir to the city of Cardiff by pipes 26 inches in diameter. The supply pipe from Llanishen is joined outside of the Llanishen reservoir by a pipe from Lisvane, an earlier reservoir, the water from both being carried to the filters at the Heath, a spot lying between the Llanishen reservoir and the city. The land taken for the purpose of filtering the water from the Llanishen and Lisvane reservoirs at the Heath is nine acres in area, the filter beds having a capacity of 1,250,000 gallons per day. The trunk mains from the Heath filter beds to the city are 30 inches and 15 inches in diameter. At each of the balancing reservoirs there is a caretaker's cottage and bye-pass mains, connecting the supply pipes above and below. The caretakers at each of these reservoirs are required to walk