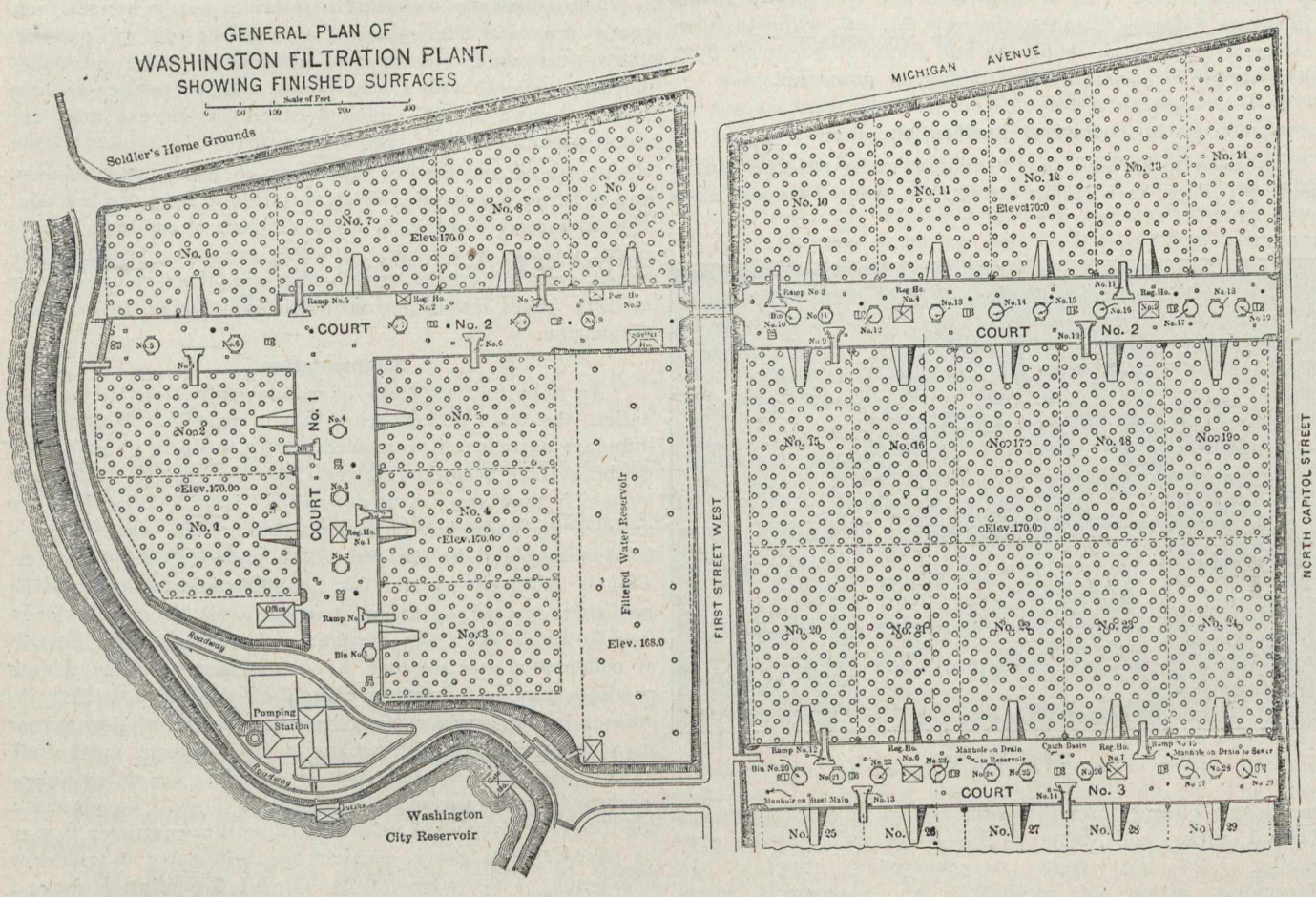
it is common to utilize sedimentation as a preliminary process in order not to put too heavy a load on the filter bed. In the Mississippi valley, and in general in the southern part of the United States below the glacial drift, the streams are normally muddy, and in many cities sedimentation plays a most important part in the purification of the public water supplies. Thus, in St Louis, Kansas City, Omaha, and many other places large settling basins have been in use for many years. For a time plain sedimentation was depended upon, but lately they have come to use alum or lime and iron as coagulants to assist the process. In St. Louis, in the old days before chemicals were used, about 70 or 80 per cent. of the suspended matter was removed by the process of sedimentation, but enough finely divided matter remained to make the effluent decidedly turbid, and visitors to the city were usually shocked by the amount of mud that would settle in a bath tub. Now the efficiency of the process is enhanced by the regular use of chemicals, although the result falls short of what would be accomplished by filtration.



At Cincinnati, where experiments were made on the sedimentation of the water of the Ohio River, it was found that after twenty-four hours' subsidence 62 per cent. of the suspended matter was removed; after forty-eight hours, 68 per cent.; after seventy-two hours, 72 per cent., and after ninety-six hours, 76 per cent. It will be seen from these figures that there is a limit to economical subsidence, which limit, of course, varies according to the nature of the suspended matter in the water.

To take another illustration: The water supply of Washington, D.C., is taken from the Potomac River at Great Falls, and passes through a series of three reservoirs before it reaches the filters. These reservoirs act as sedimentation basins. Thus, during the year ending June 30th, 1908, the average turbidity of the water in the Potomac River is 117, at the outlet of the Dalecarlia Reservoir it had fallen to 53, at the outlet of the Georgetown Reservoir to 45, and at the outlet of McMillian Park Reservoir, which represents the water supplied to the filters, 31. Sedimentation results not only in making water clearer, but it also improves the hygienic quality, for bacteria are removed as well as clay. Thus, in the three reservoirs at Washington the numbers of bacteria in the Potomac River were reduced from 6,300 to 1,200 per c.c. The action in removing bacteria by sedimentation is largely a mechanical one, the bacteria, with their sticky, gelatinous coatings, become attached to the heavier particles of suspended matter and settle to the bottom with them.

Recently attempts have been made to establish certain mathematical principles of sedimentation based on the theory of settling particles. Heretofore settling basins have been designed on the hit-or-miss principle. Sometimes they have been built shallow, sometimes deep, sometimes arranged in series, sometimes in tandem, sometimes with no baffles, and sometimes very elaborately baffled, both vertically and horizontally. The ratio of length to depth has varied all the way from 3 to 1 to 500 to 1. Logically, the length of the horizontal course of a particle passing through a basin should be equal to or not very much greater, in point of time, than the period required for the particle to settle from the top to the bottom, but the difficulty is that the particles are not uniform in size. Theoretically, the efficiency of a sedimentation basin is independent of depth except as this involves the velocity of the water at the bottom, and the deposit of suspended matter depends principally upon the area of the upturned surface exposed for the collection of the sediment.