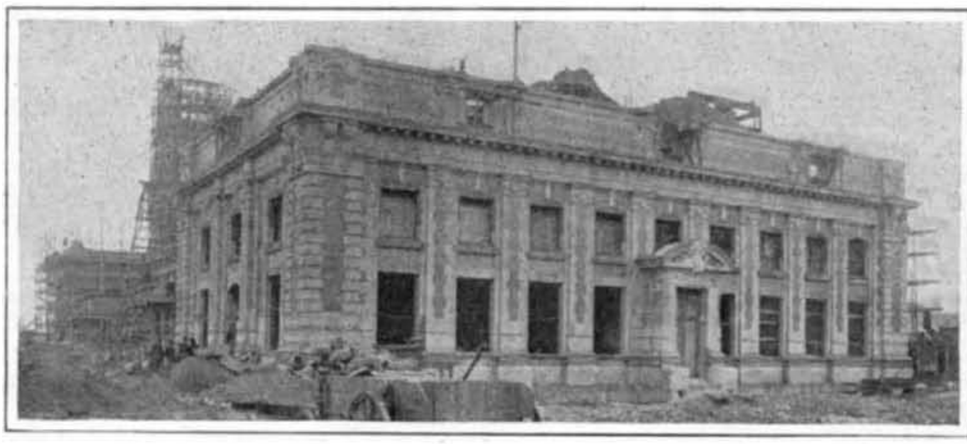
SANITATION OF THE CITY OF WASHINGTON.—I.

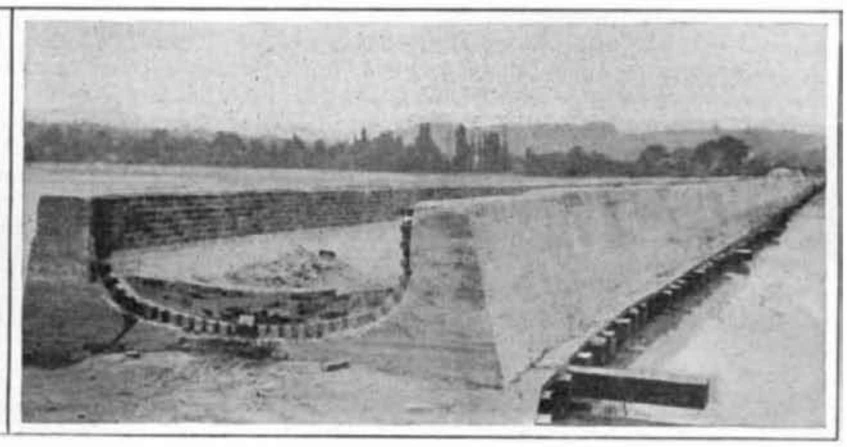
BY BEN. WINSLOW.

THE AQUEDUCT AND FILTRATION PLANT.

The average annual death rate of the city of Washington, according to the Twelfth Census, is with one exception the highest of all the cities of the United States having a population of over 100,000. The average annual death rate of Washington for the period covered by the last census is 23.09 per 1,000 population, while the average for cities of approximately the same size is about 17 per 1,000. In the table of annual death rates per 100,000 population due to typhoid fever in cities of the same class, Washington stands first with 78, which is 20 higher than Cleveland, the next highest city on the list. The capital city of the nation is now nearing the end of a costly effort to reduce its abnormally high death rate to a more reasonable figure, and the work has been done so quietly that the citizens know little of it.



A Completed Section of the Pumping Station.

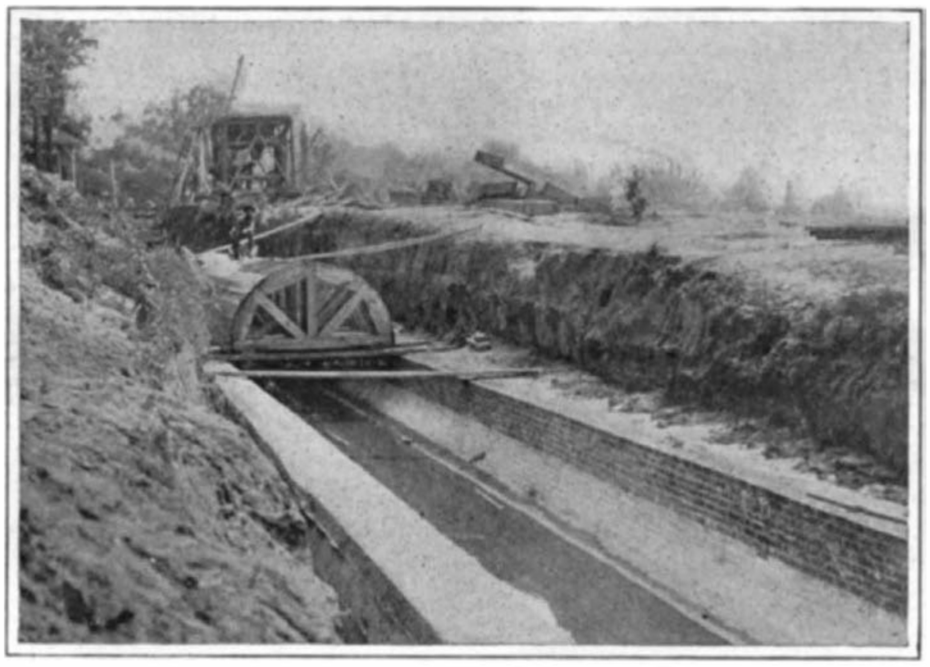


Laying the Outfall Sewer Across the Swamp Lands.

Long before the city even dreamed of a filtration plant; before the use of any filters for water, except probably inadequate and unsatisfactory individual devices, the city of Washington struggled with the momentous question of pure drinking-water supply. Major L'Enfant, under the direction of Gen. Washington, made numerous surveys, to "ascertain the practicability of obtaining a full supply of good water for the federal capital," but it was a long time before the idea of bringing the city's water fifteen miles was considered with any degree of seriousness.

The immense volume of water discharged over the Great Falls of the Potomac, situated fifteen miles above the city, marked that place as the future source of water supply many years before those in authority finally obtained the necessary means and sufficient courage to attempt what was then considered an almost impossible task. The expense was the greatest stumbling block to the Great Falls project, the estimated cost being so great that it staggered the young government; and although some surveys were made by order of Congress in 1850, owing to the lack of sufficient funds the Great Falls project was not gone into at any length, the surveys and investigations of the Topographical Corps having been confined to the Rock Creek proposition. Col. Hughes, who reported the results of the surveys, contemplated the building of a dam which would give a supply of about eight million gallons of water from Rock Creek per diem.

The population of Washington at that time was forty thousand, and this volume of water was considered sufficient to supply the city for the next forty years. The proposed daily supply was one and a half million gallons, or over thirty gallons per capita per diem. In addition to the dam, it was proposed to build a sedimentation reservoir on "Mederian Hill," and a distributing reservoir, "to be established just back of Franklin Road, the highest ground in the city." "Just back of Franklin Road" was then a considerable distance from the city; but now it is in the heart of it.



The Dry Land Continuation of the Outfall Sewer.

The Great Falls proposition originated with Capt. M. C. Meigs, of the Corps of Engineers, U. S. A. The Rock Creek project having been discarded, Congress in 1852 appropriated five thousand dollars to "enable the President to devise a plan for supplying the city with an adequate water supply," and surveys were made ove the Great Falls route during the winter of 1852-53. Congress at its next session passed a resolution which put the selection of plans in the hands of the President, and it also voted to defray from the Treasury the cost of any project he approved. The President accepted the Meigs plan, which called for a nine-foot conduit from Great Falls.

To hold the water at a proper level a dam was constructed at Great Falls, with its comb one hundred and forty-five feet above high tide at Washington, and from this dam the water was conducted through a circular conduit of brick, nine feet in diameter and having a fall of nine and one-half inches to the mile. In order to shorten the conduit and save expenses, a receiving reservoir was formed by damming the Little Falls Branch, a tributary of the Potomac, situated about five miles from Washington. With an area of little over fifty acres, it has a capacity of approximately eighty-five and a half million gallons, and is used for both storage and sedimentation. A distributing reservoir was constructed on the heights of Georgetown, about two miles from Washington, and connected with a receiving reservoir by a continuation of the conduit. The system was completed in 1863, and has been in continuous successful operation ever since.

One of the greatest problems that confronted the engineers was the placing of the conduit beneath the rock bluff which skirts the river from a point about a mile and a half below Great Falls to the intake at the dam. All but about a mile and a half of the conduit is laid under one of the finest roadways in the country. It is known as the Conduit Road, and is kept in prime condition by the War Department.

The famous Cabin John bridge, which, until the construction of a rival in Germany, was the largest single-arch stone bridge in the world, carries the conduit over Cabin John Run, and the Pennsylvania Avenue bridge, built on arches formed by the two mains which lead from the distributing reservoir to the city, carries the water over Rock Creek. The greater part of the water, however, now flows through the famous Lydecker tunnel to a reservoir on the heights to the north of the city, from which it is pumped into the new filter beds, and thence distributed throughout the city as pure water.

Breaking Ground. An Orange Peel Shovel Beginning the Work of Excavation.

The Portals of the Twin Tunnels Which Cross the River.

SANITATION OF THE CITY OF WASHINGTON.—I.

THE FILTRATION PLANT.—The water furnished to the residents of Washington by the water supply completed in 1863 was simply water from the Potomac River, collected in open basins and allowed to settle. To-day water that has been filtered at a cost of $450 a day, in a filtration plant that cost $3,468,405, is distributed through thousands of mains in the city to every fire plug and to the faucets in every house. It is still Potomac River water, but it has been cleaned and "screened" until it is as clear and sparkling as the finest spring water.

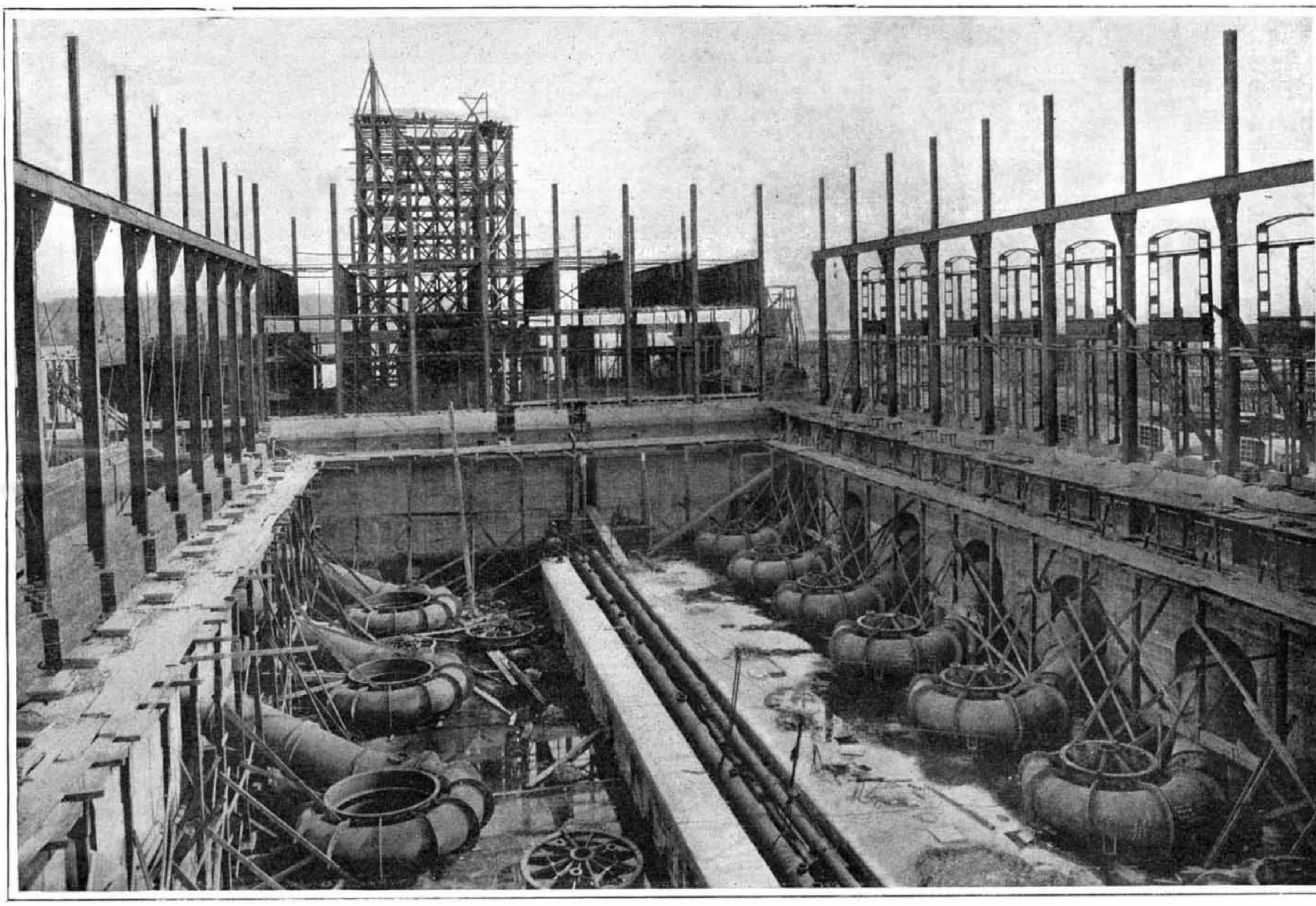
The filtration plant is one of the largest and finest filtration plants in the world. It is of the English or slow-sand type. The American, or mechanical system of filtration, which is considerably cheaper, was originally favored during the early discussion of plans, but owing to strong objection and protests against the use of a coagulant, usually alum, to precipitate the suspended matter, Congress passed an act specifying the English system. The estimated cost of filtration by this system is $6 per million gallons. The plant covers forty-five acres of ground, and in its construction 800,000 cubic yards of earth were removed, every yard by steam shovels. The filtering plant proper is divided into twenty-nine compartments of one acre each, and each bed holds 3,000,000 gallons of water. The filtering capacity of the plant is 75,000,000 gallons of water a day.

The method of filtration is quite simple. Preliminary sedimentation takes place in the Washington city reservoir, situated to the west of and quite near to the filter beds. This reservoir has a capacity of 300,000,000 gallons of water and in it much of the suspended matter is precipitated before the water is lifted by the pumps to twenty-five of the twenty-nine filter beds. The pumps deliver the water to the farthest sand beds, where it flows in at the top. From these it flows into other beds, being gradually cleaned by passing through three feet of clean, sharp sand and one foot of gravel. The water is finally collected by a carefully-planned system of under-drainage and piping and delivered to an inclosed storage reservoir. This reservoir has a capacity of 20,000,000 gallons, or about one-third of the filtering capacity of the plant. It has a cement floor and roof, supported by cement pillars.

The filter beds are thoroughly cleaned every three weeks. To accomplish this without interrupting the plant, only twenty-five of the twenty-nine beds are in operation at a time. The beds are so constructed that the supply of water to any particular bed may be cut off without disturbing the supply to the other beds. The cleaning process is going on in four of the beds all the time. About three inches of the surface is scraped off, and an equal amount of clean sand added. The water is then turned into the bed. The three inches of sand scraped from the surface is not entirely wasted. It is thoroughly cleaned in an elaborate system of sand-washing apparatus, and dried ready for use again. The sand lost in the cleaning process amounts to about five inches a year.

In order to be absolutely sure that the water issuing from the plant is pure, a completely equipped chemical and bacteriological laboratory has been established at the plant, and competent men are continually testing the water. The completed plant now resembles a great pathless park. The site presented a considerable grade toward the city, and the process of leveling left the tops of some of the beds above the street and some below. These were covered with concrete, and on this was packed two feet of earth, and practically the whole tract was sodded.

(To be concluded.)



The Syphon Chamber.

SANITATION OF THE CITY OF WASHINGTON.—I.

A New Electric Lamp.

Consul E. T. Liefeld forwards from Freiberg an abstract from a Paris newspaper concerning a new electric lamp, which it is said will considerably better the present system of lighting. The article was wired from Vienna and reads:

An Austrian chemist, Dr. Hans Kuzel, has, after many years' hard work, succeeded in constructing a new electric lamp, which he calls the Syrius lamp. As is well known, incandescent gaslight is cheaper than electric light, because the carbon filaments of the latter are very expensive and the glass bulbs soon wear out. Doctor Kuzel has now invented a new substitute for the incandescent filament by forming out of common and cheap metals and metalloids colloids in a plastic mass, which can be handled like clay and which, when dry, becomes hard as stone. Out of this mass very thin filaments are then shaped, which are of uniform thickness and of great homogeneity. These two characteristics are of great value in the technics of incandescent lamps.

The Kuzel lamp, it is claimed, uses one-quarter of the electric current which the ordinary electric lamp with a filament wire requires. Experiments, it is asserted, have shown that the lamp can burn for thirty-five hundred hours at a stretch. Another advantage is that the intensity of the light of the new lamp always remains the same, the lamp bulbs never becoming blackened, as is now the case.

A Successful Trial of Santos-Dumont's Aeroplane.

Santos-Dumont's novel aeroplane, which we illustrated in our last number, and with which this well-known experimenter has been making tests by suspending it from one of his dirigible balloons and also by attaching it to a trolley running on a rope hung from two elevated points, had its initial test in a field near Paris early on the morning of August 22.

Carrying its noted inventor in the basket, the aeroplane, propelled by a 24-horse-power, 8-cylinder, V motor, skimmed along the ground on its wheels from one end of the field to the other and back again. Several times, during the run, it raised itself off the ground a short distance. Imperfect operation of the motor was given as the reason the machine did not soar; but from the photographs and dimensions of the propeller it would appear that this was also one of the main reasons. The propeller is much too small, apparently, to be capable of exerting much thrust, and a very considerable thrust (300 or 400 pounds) is necessary to elevate a machine of this kind.

After it gets in the air, moreover, the question of stability is a grave one. On account of the dihedral angle of the planes, Santos-Dumont's aeroplane should, however, have much better transverse stability than that used by the Wright brothers.

Road-tarring on a large scale has been seen in France during the preparation for the Grand Prix race. The tarring is carried out on the Lassailly system by the use of the most improved apparatus for heating the tar and applying it to the surface of the road. Commenced on the 25th of May, the operation lasted scarcely ten days for the 500,000 square yards which were covered, employing two gangs, each made up of six drivers and eight horses, together with eight men for spreading the tar, counting the men needed for sanding the road after the tarring. A fine road is the result of this operation, and it shows that by the use of the proper apparatus a large extent of road can be treated within a short time and with a small amount of labor. At the last moment the excess of sand which covers the layer of tar will be swept off by the four sweeper wagons employed by M. Lassailly, when the cars will be able to run under ideal conditions. Such a process, far from being an extra expense, is now recognized as an actual economy, seeing that the cost of keeping up the road becomes much less, and this pays for the tarring expenses, and may even exceed the latter, as has been found during a long series of observations made in France.