

MONTHLY AVERAGE OF BACTERIA PER CUBIC CENTIMETER.  
(48-hour counts on 10 per cent gelatine media.)

MONTH.	RIVER WATER.			FILTERED WATER.			Percentage Removed.
	Max.	Min.	Ave.	Max.	Min.	Ave.	
January .....	3,250	400	1,068	264	6	38	95.4
February.....	5,200	400	1,572	180	8	52	96.
March .....	3,500	250	723	215	7	54	92.5
April.....	2,800	400	1,019	164	5	31	95.5
May .....	4,000	400	1,915	119	3	12	99.2
June .....	3,100	200	1,633	91	3	16	98.3
July .....	1,500	500	1,047	31	2	7	99.2
August .....	7,500	400	1,450	129	2	10	98.7
September.....	5,000	250	1,302	190	2	12	98.8
October .....	5,000	600	1,636	181	2	18	98.5
November .....	4,800	600	1,776	135	5	23	98.5
December.....	2,000	300	1,016	99	6	24	97.2
Averages ..	.....	.....	1,346	.....	.....	25	97.3

The present condition of the works is satisfactory. Electrolysis is causing damage in certain localities. In some cases meters have been destroyed and service pipes damaged through this evil.

The profits are paid into the sinking fund. This fund, on September 30, 1906, amounted to \$360,084.44. The profits since the installation of the service have been \$1,887,563.14. For the past ten years the profits have been:

1897 .....	\$87,074.95	1902 .....	250,582.95
1898 .....	88,638.42	1903 .....	260,507.58
1899 .....	100,959.64	1904 .....	275,961.55
1900 .....	127,357.47	1905 .....	125,900.73
1901 .....	252,761.38	1906 .....	22,867.13

The great shrinkage in the past year has been due to the very costly improvements made.

## DULUTH

By W. G. JOERNS, Duluth, Minn.

The ANNALS of January, 1906, contained an article by the present writer on the gas service of Duluth under municipal management. As the gas service of Duluth is operated by the municipality in connection with its water service and was acquired by purchase from the private interest in connection with the water service, as one transaction, a description of one necessarily contained much that pertains to both. Reference is therefore made to the article in the January ANNALS aforesaid for a general history of the establish-

ment of the water supply of Duluth as well as to details of management, and here again attention is called to this plan of management, unique in many of its features, as a valuable source of suggestion to any municipality contemplating the municipalization of any public utility. Suffice it to say here, that the record of the private company was one of poor service, extortionate and discriminating charges, an impure water supply which became a serious burden on the health of the community, and a most corrupting influence in the political life of the community. The fight against the unsatisfactory and predatory private interest by the patriotic and more enlightened part of the community was a long and bitter one. The plant was finally municipalized in 1898; and the record since then, under municipal management, has been an unbroken line of successes. The source of supply was immediately changed and the people of Duluth have, under municipal management, been furnished water that in its excellence and purity challenges all comparison. Vast extensions of the system have been developed. The pipe lines have been more than doubled, the reservoir capacity increased sixfold since the city took charge of the plant, and the rates have been reduced to practically one-half the rates that were charged under the private management. The cost of service extensions and other incidental charges have likewise been reduced in proportion. The gas and water plant combined was originally purchased by the city for \$1,250,000. The present bonded indebtedness of the city on account thereof, as shown by the last annual report, is \$2,866,000. Both gas and water plants have at all times been maintained in a high state of efficiency and repair. Old pipe and machinery have been replaced by new, and the plant entire is to-day in the highest possible state of preservation. Attention is also called to the further important fact that, notwithstanding the reduction in rates and other savings to the consumer, there has been accumulated a surplus of approximately \$140,000; and this surplus, instead of being allowed to lie idly in a sinking fund, has been expended upon the extensions of the plant. The combined water and gas plant was, in the last annual statement, inventoried at \$2,955,000.

The present reservoir capacity of the plant is approximately 30,000,000 gallons. The average daily consumption is about 5,500,000 gallons, supplying approximately 50,000 consumers. The pumping capacity is four times the present rate of consumption, one-half thereof being in the shape of a steam, the other in the nature of a newly installed electric pumping plant.

The experience of the department with water meters has been very satisfactory, and it is seeking to extend the use thereof as much as possible. In fact two-thirds of all newer extensions are metered, and as fast as opportunity offers the older consumers are placed on the meter basis. It is the rule of the department that, once so placed, they are not permitted to return to a flat rate basis; and this rule has been upheld in the courts.

Under the careless and insolent management of the private company, the water supply became contaminated and a deadly menace to the public health. Epidemics of disease were directly traced to the contaminated water supply, and this fact had much to do with the creation of the public sentiment which finally resulted in a purchase of the plant by the municipality.

One of the first steps, under the municipal control, was to provide a pure water supply by the building of an extensive supplementary system. The water furnished the consumers since that time has been absolutely wholesome.

As before stated, the present condition of the works is first class. When first the plant was acquired from the private company it was in a run-down condition; but old and defective pipe and machinery has been replaced by new and modern material, and that part of the plant is to-day in a condition immeasurably superior to that in which the city found it when first acquired. Indeed it is the aim, as it has been the custom, of the department to maintain the entire works in the highest possible state of present efficiency and to make all renewals, repairs and substitutions with this aim constantly in view. It might be well to suggest at this point that about seven miles of force main, from the present pumping station to the main reservoir, is of 42-inch steel pipe construction. Serious question has, in doleful voice, been raised from time to time as to the probable life of this steel pipe, and the prophecy, in this regard, of the divergent special interest and of those financially and constitutionally opposed to municipal ownership, has been particularly dire. Recent investigation has, however, disclosed that this pipe, though nine years in the ground, is apparently answering every expectation of a long life, with the possibility of comparatively easy repair as occasion from time to time may demand.

The department has accumulated a surplus of approximately \$140,000, which has been expended in extensions of the plant. This surplus was accumulated in the face of a reduction of the rates by one-half and a saving to water consumers in nine years of municipal service of over a half million dollars.

The topography of Duluth is peculiar in that very unusual heights of elevation are to be supplied. The main plant and reservoir system aims to supply all territory up to 290 feet above lake level. A secondary system, called the hillside system, is being installed which will supply an additional territory to the height of 550 feet above the lake level, and will require a repumping from the reservoirs. A still higher system, called the Hunter's Park system, and supplying a suburban residence section of the community, has also been installed. This system supplies territory to a height of 700 feet and requires a second repumping.

To sum up, Duluth, under municipal management, has developed a water and gas system second to none in the country as to plan, efficiency and substantial results. It would well repay any student of municipal economics to give the municipal plants of Duluth and their record a personal investigation.