To summarize, the average cost of building seven of the largest and most modern slow sand filter plants was $32,600 per million gallons daily capacity; and, likewise, the average cost of building six of the largest, and two medium size, rapid sand filtration plants was $12,100 per million gallons daily capacity. The average cost of operation and maintenance varied widely, of course, but averaged $2.86 and $4.04 per million gallons of water filtered by the slow sand and rapid sand filters, respectively. Adding these last figures to the fixed charge on the first cost of construction makes up the following totals:—

Slow sand filtration .....$7.33 per million gallons
Rapid sand filtration .....$5.70 per million gallons

Relative Hygienic Efficiency of Slow Sand and Rapid Sand Filters.—In former years the slow sand process of water purification was favored by the majority of sanitarians and engineers because it was considered that, as compared with the rapid sand process, the former process was more nearly a "natural" one and hence less liable to failure. The actual results obtained from both systems have long since shown this assumption to be unfounded. Both processes require careful and intelligent management, but there is no room for doubt that if there is any choice between the two as regards hygienic efficiency it belongs to the rapid sand process. Well designed and built plants of this type not only can purify water of any character, turbid, colored or clear, so that the filtered product will always be clear and colorless, but are less liable to show sharp diminution in bacterial (hygienic) efficiency in cold winter months, or when the character of the raw water is seriously contaminated with certain industrial wastes. Chemical treatment is an integral part of all rapid sand filter processes, but is a makeshift when used in conjunction with slow sand filter processes; and the more complicated the chemical treatment prior to filtration the more likely are the final slow sand filters to fail.

In brief, wherever chemicals are or should be used in the preparation of water for filtration, it is proof that the slow sand filter is out of its element and in a field which, on grounds of economy at least, belongs exclusively to the rapid sand system.

In support of the assertion that rapid sand systems are at least the equal of slow sand systems with respect to hygienic efficiency, Mr. Johnson presents a table showing the typhoid fever death rate in certain American cities using slow sand or rapid sand filters. It is seen that the residual typhoid in those cities having rapid sand filters is 27 per cent. less than in those having slow sand filters.

Comparative Growth of Rapid and Slow Sand Filtration in the United States.—The growth of water filtration in the United States, particularly during the last dozen years or so, has been remarkable. In 1900 but 1,860,000 people were being supplied with filtered water, and in 1905 the United States was inferior to Japan in this regard. Since 1900 the population so supplied has increased by 830 per cent.

In the decade 1900-1910 slow sand filtration showed a remarkable increase with respect to the population supplied from such plants. This was largely due to the construction of the plants in Philadelphia, Pittsburgh and Washington, these three cities contributing over 2,000,000 of the increased population served by that system of filtration noted in the decade 1900-1910, namely 3,523,000. The increase during the same period in the number of people supplied with water from rapid sand filter plants was even more remarkable, totaling 5,422,000, or 54 per cent. greater than in the case of the slow sand filter systems.

"Since 1910 the slow sand filter has failed to maintain the rate of increase noted during the previous decade, the additional population served at this date, as compared with 1910, being 1,515,000. During the same period the additional population served by rapid sand filters was 4,971,000. The proof is plain, therefore, that the slow sand filter has about reached its limit, while the rapid sand filter is growing faster each succeeding year."

The paper contains tables and diagrams serving to show how the practice of water filtration has grown, and the respective parts which slow sand and rapid sand filter processes have played in the development of this important branch of municipal sanitation.

It is to be noted that of 40.68 per cent. of urban population supplied with filtered water 27.98 per cent. is supplied from rapid sand filters.

GOOD ROADS PREVENT DISEASE.

Few persons, on first thought, would see any possible connection between good roads and good health. Yet the State Boards of Health of Ohio and Kansas say that by the removal of weeds and trash good roads can and will prevent disease. Weeds and trash prevent the prompt evaporation of moisture and promote retention of ground water. This makes ideal breeding spots for mosquitoes, flies and other insects, which are known as disease carriers, not to mention chinch bugs, hoppers and other insects which are crop damagers. Furthermore, an undergrowth of weeds invites the dumping of garbage and manure by offering concealment, of which fact careless and thoughtless people are prone to take advantage, thus increasing the facility of insect breeding and providing these insect carriers with proper material for disease transmission.

Good roads also prevent disease by providing good drainage. Many farms have no means of drainage except by ditches along roadways. Open ditches, clear of brush and debris, with hardened surface and proper fall, afford these farms the opportunity of ridding themselves of many a stagnant pool. The removal of weeds, proper road grading, surface hardening and oiling, insures prompt drainage of all pool, ditch and surface water, removing the possibility of insect breeders, for none can multiply without moisture. Road oiling in itself is destructive of insect larvæ, especially mosquitoes—a well-known fact. Dry roads offer pedestrians, and notably children who are compelled to walk to and from school, dry shoes and feet. While colds are due to specific germs, yet it is a well-known fact that cold, wet feet and chilled limbs lower the resistance of individuals and make them more favorable subjects for infections of the respiratory passages, including pneumonia and tuberculosis. Good roads prevent disease by setting an example to adjoining farm premises. Good roads promote travel and set an example to the farmer whose premises are bordered by them. The comparison of a well-graded, clean highway with an unkempt and trashy barnyard adjoining is sufficient to stimulate every landowner to a clean-up. Pride compels him to offer to passers-by a neat-appearing and attractive house and barnyard. Results are only too obvious. Good roads are active disease prevention agencies, aside from their financial and commercial value.