Bock and Schwarz, Hanover, in 1899, were cited, where it was found that with a velocity between .014 and .027 feet per second, 55.7 per cent. of the suspended solids were settled out in 2¼ hours. When the period of retention was increased by 50%, this percentage of sedimented solids became 61.5. Steuernagel reported that complete quiesence for 12 hours removed 84%. Of American data the Columbia tests are noted.

The writer calls attention to the criticism which is attendant upon the method of expressing the sedimented solids as a percentage of the total solids in suspension, the latter having been determined by careful filtration of samples, in estimating the efficiency of sedimentation processes.

"Without doubt it leads to confusion in a comparison of results since it takes no account of the fact that there are always some solids which refuse to settle because their specific gravity is practically that of the water containing them or else through fine division they are in a state of semi-solution. A sedimentation plant has no more concern with non-settling solids than it has with matters in solution."

The paper goes on to describe the first attempt, by W. J. Dibden, London, at giving separated sludge a treatment independent of that given to the liquid sewage. Mr. H. W. Clark's observations (1899-90) were outlined, and followed by a full description of the Travis or Hampton hydrolytic tank, patented and put into service in 1903 and now in operation on a commercial scale at Hampton, Norwich and Luton, England. The circumstances surrounding the first German modification of this tank are also described in an interesting way.

Prof. Gillespie then traces the development of the septic tank, outlining the early experiments, particularly those of Doctors Guth and Spillner. The work of the Emschergenossenschaft was described,* and the typical Emscher plant outlined in detail. Each part, *viz.*, storm overflow weirs, screening chamber, detrieus tank or grit chamber, Imhoff sedimentation tank, and sludge beds, is taken up, carefully studied, and illustrated. An interesting parallel is drawn between what is commonly called the "British" and "German" methods, the former, as already described, embodying sludge digestion in separate tanks, and the latter, sludge decomposition in 2-story tanks. Both processes are termed satisfactory; both produce inoffensive and quick-drying sludge. Commenting upon them, the writer states that his observations have led him to believe that sludge which has been thoroughly digested in separate tanks does not differ materially as to character or quantity from that which has undergone digestion in Imhoff tanks, or indeed in ordinary septic tanks. "There are, however, certain objections to the method of decomposition in separate tanks which are significant. In the first place, where separate digestion tanks are employed, the overflowing excess liquid is very offensive and the escaping gases are likely to be very noxious also. Again, for the maintenance of bacterial life, it seems obvious that the food supply (fresh sludge) should enter the chamber continuously, and that the rotted sludge should be withdrawn as nearly as may be in the same way. The separate tank does not usually provide for this, while the two-story tank does. The proper environment seems to require time for its development, and after this environment is once created, it seems like taking a great risk to renew the entire contents of a tank at one operation instead of permitting the supply of food to come in gradually. Experience, moreover, has shown that the time required for complete digestion is likely to be longer in the separate tanks than in those with two stories. The body of water overlying the sludge in the decomposing room of two-story tanks, performs a function which it is not possible to duplicate in the ordinary tank for separate sludge digestion. This body of water is a medium in which the old sludge and the new, through the ebullition caused by the escaping gases, have an opportunity of becoming mixed, and one in which, as explained later, its soluble constituents may often exert an important influence in preventing acid decomposition.

"Fresh sludge separates from its water only with the greatest difficulty, the reason being the attraction of its contained colloid constituents for water. Structurally, the mass is supposed to be divided into cells by a network of amorphous membranes, which cells dilate as the liquid

*See *The Canadian Engineer*, June 25, 1914, for an article entitled "The Method and Work of the Emschergenossenschaft," by Prof. P. Gillespie, C.E.

## Data Concerning Two-Story Sewage

| | Date of Completion | Population for which designed | Number of Tanks | Radial or Longitudinal Flow | Open or Covered | Depth | Flowing through time | Mean Velocity in Sedimentation Chamber | Capacity of Sludge Room |
|---|---|---|---|---|---|---|---|---|---|
| Carleton Place, Ont. | 1914 | 4,000 | 2 | Longitudinal | Covered | 26 ft. | 3 hrs. | 3 ins. per min. | 6,000 cu. ft. |
| Edmonton, Alta. | Not Started | 10,000 | 2 | Longitudinal | Covered | 24 ft. | 2 hrs. | 7.2 ins. per min. | 22,000 cu. ft. |
| Hamilton, Ont. | 1914 | 70,000 | 4 | Longitudinal | Open | 28 ft. | 2½ hrs. | 21 ins. per min. | 6 mos. accumulation |
| Kelowna, B.C. | 1913 | 3,000 | 1 | Radial | .... | 23 ft. | 2 hrs. | ..... | 2,750 cu. ft. |
| Peterboro, Ont. | Not Started | .... | 8 | Longitudinal | Covered | 27 ft. | ½ hr. | 29 ins. per min. | 42,700 cu. ft. |
| Stratford, Ont. | Under Construction | 17,000 | 2 | Longitudinal | Open | 24⅜ ft. | 1¾ hrs. | ..... | 21,400 cu. ft. |
| Weston, Ont. | 1913 | 3,000 | 2 | Longitudinal | Covered | 18 ft. | 2 hrs. | 4.8 ins. per min. | 1,500 cu. ft. |