sewage. Referring to a later and much larger installation at Norwich, England, Mr. Arthur E. Collins, Mem. Inst. C.E., City Engineer, Norwich, states: "The operation of the tanks in Norwich has been uniformly successful. The average removal of solids amounts to between 90 and 94 per cent. of the total contained solids of the crude sewage."

The tanks at Norwich are divided into three longitudinal compartments, of which the two upper are for the sedimentation of the sewage and the lower one for the collection and retention of sludge. The sedimentation chambers receive the entire volume of sewage, the greater portion of which traverses their full length and is discharged over weirs into the effluent channel. A small portion of the sewage descends through openings at the bottom of the sedimentation chambers, carrying with it the accumulated suspended solids, passes through the reduction chamber at greatly reduced velocity, and deposits its burden of suspended solids in the sludge pockets at the bottom of the chamber.

Any action in the reduction chamber will be similar to that in a septic tank, but in a more or less modified form, depending on the length of time the sludge is retained. With long sludge retention there will be the same formation and eruption of gas and resulting disturbance of the sludge, which, however, has no effect on the liquid flowing through the sedimentation chambers. Following such eruptions, the reduction chamber effluent will carry some of this disturbed deposited matter out of the chamber. These solids are eliminated in the small up-flow chamber through which this effluent passes.

Owing to the fact that English sewage is at least three times as strong as American sewage, it is commercially impossible to eliminate from American sewage by sedimentation alone as high a percentage of suspended solids as is stated above. All the available data indicates very strongly that under average American conditions the sedimentation chambers of two-story tanks should have a capacity of from one-tenth to one-eighth of the total daily flow of sewage. With an average retention period of from two and one-half to three hours the Hampton tank will show an elimination of suspended solids of about 65 per cent.

Sludge storage capacity should be determined in each case by such local conditions as climate, proposed method of sludge disposal or utilization, subsequent treatment of the effluent, etc.

The electrolytic treatment of sewage is not a new idea; Webster patented such a method of treatment in England nearly twenty-five years ago. Electrolytic sewage treatment works which seem to follow Webster's method in a general way are in operation at Santa Monica, Cal., and at Oklahoma City, Okla., but in neither case is any attempt made to clarify the sewage nor to obtain the benefit of the secondary, or time, reactions, which would materially reduce the cost of operation.

There are many cases in which a well-clarified effluent, if free from pathogenic germs, would meet all reasonable requirements. In such cases the sewage, or so much of it as may be necessary, can be subjected to an efficient preliminary electrolytic treatment and then passed through a Hampton tank to allow time for the secondary reactions and for clarification. Electrolytic treatment not only produces a powerful germicide, sodium hypochlorite, from the salts which are always present in sewage, but it also serves to coagulate the finely divided suspended solids, or colloids, and the simpler forms of dissolved organic matter, which can then be eliminated by sedimentation. Furthermore, since sedimentation is much more rapid after electrolytic treatment than under natural conditions, a material reduction can be made in the capacity of the sedimentation chambers without reducing the percentage of clarification.

This combination of electrolytic and tank treatment makes it possible to eliminate from 80 to 90 per cent. of the suspended solids of the crude sewage, make an appreciable reduction in the dissolved solids, and produce an effluent which is well clarified, odorless and free from pathogenic germs. The danger of such a plant ever becoming a local nuisance is reduced to a minimum.

DISPOSAL OF REFUSE IN TOWNS AND CITIES.

Refuse disposal is usually a serious problem for the small city or town to solve. In such cases public incinerators are not always economical and the ordinary dump needs careful regulation to prevent it becoming a nuisance.

Burning or burying is the most desirable method of disposing of ashes, rubbish, manure and garbage in cities. Of these, burning is the most sanitary, and no other means should be used in cities having a population of, say, 20,000, or more. Refuse incinerators are of two main types (1) the coal-fired or "low temperature," and (2) the high temperature. The latter is designed to handle mixed garbage without the use of coal. Very few of these have as yet been installed, and their advantages have not been entirely proven. For the coal fired incinerator a long-flaming coal of good quality is essential. This, of course, makes the cost of operation all but prohibitive for most small cities and towns.

In such cases, other means of refuse disposal must be obtained. To simply dump garbage in an unrestricted manner on some vacant lot should be classed as a criminal offence, and punished accordingly. The practice of burying refuse, where it is carefully carried out, is usually found to be cheap and at the same time effective.

The principle upon which refuse burial rests, especially as applied to garbage, is, primarily, a bacteriological one. The action of the soil bacteria is to mineralize the organic matter in the refuse. In order to prevent the occurrence of putrefactive or other objectionable odors the mineralizing process must be carried out in the presence of sufficient oxygen or air. To secure these conditions the following points should be observed: (1) The garbage should not be buried too deep, nor should it be spread in too thick a layer on the ground. (2) The ground used should be sufficiently porous and well drained to admit the air readily. (3) The garbage should be mixed with enough other refuse to prevent overloading the soil.

These conditions are obtained in different ways. In some cities the refuse is spread on the ground and then ploughed under. Another method is that of digging a trench, covering each day's collection of refuse with the soil, removed for the next day's supply. In any case, refuse that can be burned should be so treated and garbage and other organic waste can be more effectively handled by mixing it with other waste such as ashes, street sweepings, etc. It is claimed that 1.5 acres are necessary to handle each daily ton of garbage permanently. The soil can be re-used at the end of two years.—Conservation.

Three free scholarships, each covering four years' tuition in the Faculty of Applied Science at McGill University, have been offered by the Grand Trunk Railway Company to apprentices and other employees under twenty-one years of age, sons of railway employees. The competitive examination will be the regular university matriculation examination, beginning June 12th. The three candidates making the highest scores will receive the scholarships. Students will be required to enter the service of the company during vacation periods.