

arm of the law could be used against these charlatans and I should be willing to entrust to the State Department of Health all the power that it might need for correcting this abuse.

But doubtless it would not like to take this police duty upon itself. Its important function is one of co-operation, instruction, and organization. And in this work it should be given the utmost of our support. It can look to no other professional group more interested in the prevention of disease than are we engineers. This is our job as well as the Departments. To it we look for guidance. The State Departments of Health are the directors of the modern public health movement which in the words of Winslow "is based upon democratic education of a free and intelligent people by the force of intelligent leadership."

CITY SANITATION PROBLEMS

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The first problem when sewage treatment becomes necessary is to collect all the sewage, or as much of it as may be possible under local conditions, in one place for treatment. If a master plan for the sewerage system has not been prepared and all sewers and interceptors have not been constructed as a part of that plan, the cost of intercepting and connecting sewers may be enormously increased, and in some cases works which have been constructed may become entirely useless.

Our cities and towns in Indiana are not "boom towns" of the mining or oil field class. They are permanent, and it is obvious that it is almost criminally shortsighted to fail to plan a sewerage system to meet the needs of the future. No project which involves such large expenditures or is so closely related to the public health, welfare, and comfort as is a sewerage system or sewage treatment plant, should be constructed without competent engineering advice. Many Indiana cities and towns have wasted money on sewers and sewage treatment works which were not properly designed. Money so spent is twice wasted, since the works will have to be reconstructed sooner or later.

NECESSARY SEWERAGE FACILITIES

As was said, the first problem in providing sewage treatment is to get all of the sewage in one place. For this purpose, it is usually necessary to construct collecting or intercepting sewers which receive the discharge of various sewers and convey it to the site of the treatment plant. The construction of such intercepting sewers should be carried out as

rapidly as possible in all cases, not only as a part of the sewage disposal program, but also to remove from the stream, as it passes through the city or town, as much sewage as possible. In some cases, the principal ill effect of the discharge of sewage into a stream is the production of local nuisances at sewer outlets within the corporate limits. Intercepting sewers which would collect the sewage and convey it to a point outside the city would obviate these nuisances. Such interceptors should be built as early and as rapidly as possible so that, when sewage treatment becomes necessary, the cost of the interceptors and treatment works need not be met at the same time.

An important part of the problem is to treat the sewage, after it has all been collected at one point of discharge, so that the material which finally goes into the stream will not produce objectionable conditions.

There are several methods of sewage treatment which may be applied satisfactorily in most cases. It is not our purpose to state definitely that any one method should be used in preference to others, or is superior to all others, for this can only be determined after a close study of the sewage to be treated and the preparation of comparative cost estimates.

One method which has been practiced for some time is known as sedimentation and digestion in two-story or Imhoff tanks. Briefly, in this method the sewage flows horizontally through the upper compartment of a two-story tank. The suspended solids settle through a slot into the digestion chamber below. The sludge which forms in the digestion of the settled material is usually drawn off every few months and can be dried readily on sand beds. This sludge when dried is not offensive and can be used as fertilizer or as fill about the plant.

After passing through the Imhoff tank, unless a relatively large stream is available, the sewage usually requires further treatment by filters which depend on biological rather than straining action.

Another common method of disposal, somewhat similar to the Imhoff tank method, is one in which the sewage is settled in one basin and the solids are removed and digested in a separate tank. The liquid then may be further treated by passing through a filter bed. The sludge drawn from the digestion tank is very similar to the Imhoff tank sludge.

A type of sewage treatment which has not been practiced as long as the Imhoff tank method, but which is rapidly gaining favor, is known as the activated sludge process. In this process, fresh sewage and previously aerated sewage sludge are mixed together and supplied with oxygen. The previously aerated sewage sludge or activated sludge contains masses of aerobic organisms which have the power of purifying the sewage to a certain degree. After this activated sludge is added to the incoming sewage, it is kept in aeration tanks for

a period of time. It is then run into other tanks where it is allowed to settle. The liquid which passes off is usually clear and may be put into the diluting body of water without further treatment.

The waste sludge may be digested and dried or may be put through a dewatering process. The material resulting from this dehydration process is sold in many cases as a high-grade fertilizer.

These methods of sewage treatment and their variations are probably the ones most practicable and most generally used. It should be borne in mind that, while septic tanks under certain conditions sometimes provide adequate treatment for the sewage from a single residence, they are not adapted to the treatment of sewage on a municipal scale.

It is probable that no matter what method of sewage treatment is employed, there will be some wastes which, because of their unusual character or strength, will have to be treated by the industries giving rise to them before discharge into the city sewerage system or stream. It is possible in many cases slightly to change manufacturing processes or to re-use waste process water, thus preventing its discharge into a stream. In some instances such changes not only have produced an improvement in the stream, but also have resulted in a material saving to the industry.

METHODS OF FINANCING

There are several schemes by which municipalities can finance the construction of intercepting sewers and sewage treatment works. The method to be followed depends largely upon local conditions, which must be studied closely before the proper choice of method can be made.

If a city or town has sufficient bonding capacity, the entire project can be financed by the sale of municipal bonds. However, if the municipality cannot raise the necessary amount without exceeding the constitutional limit of indebtedness of two per cent of the assessed valuation, several other methods of financing are available. It is entirely possible, when the bonding capacity is limited, to finance the construction of the treatment works by a bond issue and assess the cost of the intercepting sewers upon the benefitted property as provided in the Barrett Law.

The Barrett, or special assessment law, makes it possible to assess the cost of intercepting sewers or treatment works, or both, against the benefitted property. Under this plan the assessments may be paid at once, or on the installment plan over a period of ten years.

A type of sanitary district can be formed which includes only one city. In this type of district, the entire city becomes a special assessment. Such a district can be formed by the council, by ordinance, establishing a "Department of Public

Sanitation" under the provisions of Chapter 157, Acts of 1917 (as amended).

This department is administered by a board of sanitary commissioners. This board, which is composed of the city engineer, an engineer nominated by the State Board of Health and appointed by the mayor, and a third man selected by the other two, serves for a four-year term and can only be removed for cause.

This department of public sanitation can issue bonds up to two per cent of the assessed valuation of the city and levy annually a tax not to exceed twenty cents on each one hundred dollars of taxable property for paying costs of operation.

SANITARY DISTRICT

Under the provisions of Chapter 307, Acts of 1913, amended 1931, two or more contiguous municipalities located in the same county can form a sanitary district for the purpose of building and operating intercepting sewers and sewage treatment works. Territory in the same or an adjoining county may be annexed to an existing sanitary district. The executive authority of such a district is vested in a board of trustees made up of five men appointed by a board composed of judges of the Circuit and Superior Courts. These trustees are appointed for four-year terms. The appointive board may remove any of the trustees from office at any time.

The sanitary district has the power to issue bonds up to a total amount which cannot exceed two per cent of the valuation of the taxable property within the district. Such bond issues must be approved by the city council or board of trustees, as the case may be, of each incorporated municipality within the district.

In counties of less than 25,000 population the Board of Trustees may levy and collect taxes to carry on the corporate purposes of the district provided the aggregate amount of such taxes do not exceed one per cent of the valuation of the taxable property within the corporate limits. In counties of over 25,000 population the aggregate amount of such taxes shall not exceed one fourth of one per cent of the evaluation of the taxable property within the corporate limits.

In order to form such a sanitary district in counties of over 25,000 population, it is first necessary that 500 freehold voters petition the county commissioners to cause the question of forming the district to be submitted to the voters. It is further provided that there be at least 100 signers of this petition from each city. In counties of less than 25,000 population, it is necessary that the petition to the county commissioners be signed by at least 50 freehold voters residing within the limits of the proposed district.

The county commissioners then establish the boundaries of the proposed district and submit the matter to the voters at a

special election. If the election is favorable the district is then established as previously outlined.

This method of providing funds for constructing and operating the necessary treatment works and interceptors is practical and could be followed by several Indiana municipalities if deemed advisable.

PUBLIC UTILITIES

Under Chapter 104, Acts 1911, a private corporation can be granted a franchise and allowed to construct the necessary interceptors and treatment plant. The law provides in such cases that the city or town can purchase the sewerage system from the utility at any time either by buying it outright or on the payment plan.

It is also possible under this statute for a city or town to sell municipal bonds and hold stock in the utility, gradually retiring the stock held by the Utility Company as the funds become available.

It may be well to mention other methods which are available in some states for financing the construction, maintenance and operation of sewage works. In Ohio, Wisconsin, and several other states, it is possible for a municipality which owns, leases, controls, or operates a sewage disposal system, to pass an ordinance establishing service charges to be paid to the municipality by persons, firms, or corporations using this sewage disposal system. The funds derived from this charge can be used toward financing the maintenance and operation of the system, to pay off interest or indebtedness incurred for the construction or enlargement of the system, and to create a sinking fund to pay for any such indebtedness. Such service charges are really of the same nature as charges for water service; that is, they are charges for carrying away and disposing of the water which is bought in the first place.

Another procedure for financing the construction of sewage works, which has grown out of the Michigan mortgage bond scheme and is known as the revenue bond method, creates a municipal sewage treatment utility and provides for the sale of revenue bonds. The payment of interest and redemption of the bonds would be made from the revenue derived from service charges placed upon the sewer connections.

LEGAL MEASURES

If it is indicated that a stream pollution problem is not to be solved through co-operation, there are laws of the State of Indiana and regulations of the State Board of Health which will pertain to the case and which are enforceable.

The jurisdiction and legal status of the Indiana State Board of Health regarding the pollution of streams and lakes of the State are set forth in the following laws and regulations:

Chapter 144, Acts of 1909. Chapter 144, Acts of 1909, states that it shall be unlawful for any person, firm, company, or corporation to institute, permit, or maintain any conditions whatever which may transmit, generate, or promote disease.

Chapter 24, Acts of 1909. Chapter 24, Acts of 1909, Section 1, read as follows:

“Streams—Pollution—State Board of Health

“Section 1. Be it enacted by the General Assembly of the State of Indiana, That whenever the common council, board of health of any city, or town, or the board of county commissioners of any county, or the trustee of any township, in this state, shall make complaint in writing to the State Board of Health, charging that any city, town, village, corporation, person, or firm named in said complaint is discharging, or is permitting to be discharged, any sewage or other wastes, or befouling or deleterious matter into any stream, water course, river, spring, lake or pond, and is thereby materially injuring, for domestic use, the character of the water into which the same is discharged to the injury of public health or comfort, or is polluting the source of any public water supply, it shall be the duty of the State Board of Health to forthwith inquire into and investigate the conditions complained of, and if, upon such investigation, said board shall find the charges, or any of them, made in such complaint to be true and that the conditions produced by the acts complained of are detrimental to public health or comfort, or to the comfort and health of persons residing in the vicinity of the water so befouled, it shall notify the person, municipality, corporation or firm causing the pollution, of the board’s finding, and, in the notice, shall fix a time for hearing. After such hearing, if the State Board of Health shall determine that the person, municipality, corporation, or firm, should cease doing the acts complained of, it shall enter an order to that effect against the offender, and shall at the same time suggest such improvements or changes in the offender’s works, plant or property, if any said board knows of, as will render the noxious matter so being passed into the water innocuous and harmless, and shall require by its order, the offender to adopt and apply the board’s recommendations in that behalf before the offender shall again resume such use of the water; and such board shall in its order requiring the offender to discontinue the use of water, give to such offender a reasonable time to adopt, construct and put in use the appliances so recommended by the board, and such order shall in each case indicate as a part thereof the time given to such offender: Provided, however, That in the event said board of health find that any offender is polluting the source of any water supply, the order of said board of health against such offender shall take effect immediately. The provisions of this section shall not apply to or be enforced against

any city, town, village or other municipality located on any stream, any part of which forms the boundary between the State of Indiana and another state, or any part of which flows from another state into the State of Indiana, so long as the unpurified sewage of cities, towns, villages, corporations, persons or firms of such other states is permitted by law to be discharged into such streams upstream from such Indiana city, town, village, or other municipality."

Chapter 45, Acts of 1927. Chapter 45, Acts of 1927, reads as follows:

"Pollution of Streams Declared Unlawful in Certain Cases

Section 1. Be it enacted by the General Assembly of the State of Indiana, That it shall be unlawful for any person, firm, or corporation to throw, run, drain, or otherwise deposit into any of the waters of this state, or to cause, permit or suffer to be thrown, run, drained or otherwise deposited into any such water or waters, any dye-stuff, acid, coal-tar, oil, log wood or any by-products or derivative of any such, or any other poisonous substance, which of itself is deleterious to the public health or to the prosecution of any kind of industry, lawful occupation or calling for which, or in which any such water or waters are or may be lawfully used or employed, or whereby the carrying on of any agricultural, floricultural, or horticultural pursuit may, or shall be, adversely affected, or whereby any live stock industry or the use of any such water or waters by or for domestic animals, may be lessened or impaired, or whereby any lawful use of any such water or waters by the State of Indiana or by any political subdivision thereof may be lessened or impaired or materially interfered with, or whereby any beneficial animal or vegetable life in said water or waters may be destroyed or jeopardized: Provided, however, That none of the provisions of this act shall apply to Lake Michigan or to the rivers, streams, or any of the artificial channels or drains which empty into Lake Michigan along the shore line of Indiana or Illinois.

Suits to Abate Violations or Threatened Violations

Section 2. For the purpose of enforcing the provisions of section 1 of this act, and to restrain and prevent violations of any of the provisions of said section, a suit or suits may be brought to abate such violation or threatened violation thereof, by any person, firm, or corporation, who shall have suffered, or be threatened with damage by reason of actual violation by any person, firm, or corporation of any of the provisions of section 1: Provided, however, That such suits shall be originated in any superior or circuit court in and for the county wherein any such violation shall occur or be threatened.

Investigation and Advice by State Board of Health

Section 3. The State Board of Health shall study and investigate the waters of the state and waters forming the

boundaries thereof, for the purpose of determining the use of such waters, the causes contributing to their pollution, the sources and the effects of such pollution and the practical method or methods of preventing and correcting such pollution and of maintaining such waters in such condition as to prevent damage to public health and public welfare. Said State Board of Health shall advise and co-operate with municipal corporations and the industries of the state in finding the proper solution for such problems.

Orders of Abatement—Appeals

Section 4. The State Board of Health shall have the power and authority to order an abatement of any condition or practice done in violation of any of the provisions of this act, by any municipal corporation, person, partnership, firm or corporation. Such order shall be a specific written order fixing a reasonable time for the abatement of said condition and, shall be duly served upon the proper officer or agent of the corporation, firm or person against whom said order is directed. Within ten days after the service of such notice the corporation, firm or person against whom the same is directed may appeal from the order of said board to the circuit or superior court of the county in which the same is effective, by serving a written notice of such appeal with the said board of health. When any such appeal is taken as herein provided it shall be the duty of the secretary of the State Board of Health to certify copies of all papers, pleadings, and orders made in such cause to the clerk of the court to which said appeal is taken. Upon receipt of said certified documents said clerk shall docket said cause as a civil action upon the dockets of said court. Issues may be formed in said cause and said matter shall be tried as a civil action and the court shall have full and complete authority to hear, try and determine the same. Upon final determination of said cause the clerk of the court shall certify the judgment of the court to the State Board of Health and said board shall modify its order of abatement in accordance with the terms of the judgment of said court.

If no appeal is taken from any order of abatement so made from the State Board of Health as aforesaid within the time herein fixed for such appeal, said order shall become effective and final.

Penalty

Section 5. Any person, firm or corporation violating any of the provisions of this act shall be fined in a sum not less than \$25 nor more than \$200 and each day's violation of any such provision may constitute a separate and distinct offense."

Chapter 169, Acts of 1905. Chapter 169, Acts of 1905, Section 535, states that to cause or suffer any offal, filth, or

noisome substance to be collected or to remain in any place to the damage, prejudice, or discomfort of others or the public constitutes a public nuisance and as such is subject to court action. It is further provided that it shall be unlawful to divert any stream of water from its natural course or state, to the injury of others.

State Board of Health—Rule SE 12. Rule SE 12 which requires the treatment of sewage and industrial wastes before discharge into watercourses or streams states: “Whenever investigation by the Indiana State Board of Health shall show that the discharge of untreated or insufficiently treated sewage or industrial waste into a watercourse or stream does produce conditions prejudicial to the public health, the person, firm, corporation or the municipality discharging or permitting to be discharged any such untreated or insufficiently treated sewage or industrial waste into a watercourse or stream shall, upon receipt of an official order from the Indiana State Board of Health, immediately proceed with the construction of such works, or take such other steps as may be necessary to abate the conditions prejudicial to public health.

Provided, however, That before any such official order shall be issued, a hearing shall be given, at a regular or special meeting of the Indiana State Board of Health, to the said person, persons, firm, corporation, or municipality.”

State Board of Health—Rule SE 13. Rule SE 13 reads as follows:

“Prohibiting Pollution of Lakes

1. The discharge of untreated or insufficiently treated sewage into any lake in Indiana shall be prohibited.

2. This rule shall be in full force and effect on and after January 1, 1926.

3. Untreated and insufficiently treated sewage, under the meaning of this order, shall include all liquid wastes from residences, business buildings, institutions, public or private, and from industrial and other establishments which have not been subjected to proper and sufficient treatment to remove the contained impurities to a degree which will render them incapable of contaminating any of the lakes to the detriment of public health.”