

the base of all depressions for use in emptying the pipe. Nozzles providing for corresponding air valves will be inserted in top of the pipe at every summit point. As announced in *The Canadian Engineer* for April 16th, the contract for the construction of this riveted steel pipe line from Humpback to Smith's Hill reservoir was awarded by the city council to the Burrard Engineering Company, the price being \$304,000.

The work, since its abandonment by the Westholme Lumber Company, has been carried out under the direction of the City Water Commissioner, Mr. Chas. H. Rust. In July, 1911, Mr. Wynne Meredith was retained as consulting engineer on the project. Mr. Boyd Ehle is resident engineer.

It is estimated that the cost of delivering 16,000,000 gal., which is the maximum capacity of the concrete gravity flow pipe line, including all charges, will be  $2\frac{3}{4}$  cents per thousand gallons. The proposed raising of the dam at Sooke Lake to include the Leech River supply, as outlined in Mr. Meredith's 1911 report, will provide approximately 54,000,000 gal. per day, and will lower the cost to about  $1\frac{1}{2}$  cents per thousand gallons. It will provide the city of Vancouver with a reservoir storage of 17,358,000,000 gallons from the combined watersheds.

#### WATER SUPPLY AND SEWERAGE SYSTEMS FOR SMALL COMMUNITIES.

THE benefits to be derived from a public water supply and sewerage system have been brought out very prominently by Mr. W. H. Dittoe, chief engineer, Ohio State Board of Health, in the official organ of the board. The advantages resulting from community life have been recognized since the beginning of history and we are told that in the most remote times the people banded together forming tribes or communities to mutually assist in their own betterment. Out of this tendency grew the ancient town in which the inhabitants were more or less committed to mutual protection. The advantages of community life have progressed with the advance of civilization and learning and in comparison with advantages offered by the modern community those of ancient cities or villages appear insignificant. Community life has its disadvantages, however, and becomes a detriment to the welfare of the people unless necessary municipal improvements are provided. In the present day a community to be considered modern must provide every possible municipal improvement for the convenience of its citizens as well as for its own development and growth. The large cities can, and do, expend great sums of money in providing public water supplies, sewerage facilities, street paving, collection and disposal of waste material, street cleaning, municipal lighting and numerous other public service advantages. This extensive municipal improvement is not possible in the smaller communities, but in every case those improvements which affect the health of the community may reasonably be demanded. In this classification fall public water supplies and sewerage systems. Unless a community can offer the benefits to be derived from such installations the advantages from community life are minimized and overbalanced by the dangers to which the inhabitants are subjected. This neglect results not only in general unhealthful conditions but also in retarding the development and growth of the community.

The installation of a public water supply, which will furnish the maximum benefit to the community, should be

the first step taken in the development of municipal improvements. Following the provision of a public water supply and simultaneously with it, if possible, a complete sewerage system should be installed. After these most important improvements have been provided other municipal enterprises may be undertaken as the financial condition of the community will permit.

Public water supplies are obtained from two general sources, namely, from surface streams, lakes or ponds and from underground water-bearing formations. In either case it is well to remember that the original source of the water is the same, namely, precipitation. In spite of the popular belief, not all water supplies obtained from underground sources are suitable for public supply purposes. Water obtained from surface sources is rarely, if ever, to be considered satisfactory in its raw state. In the selection of any source, due attention must be given to the quantity available, for in many cases a disregard of this important factor has led to considerable financial loss. The development of the supply is also of great importance, as upon this may depend the maintenance of the good quality of the water. Proper management and operation of the works after they are installed is a factor influencing the benefits derived from the supply. Also, the advantages of a water supply cannot be fully derived until the supply has come into general use by the citizens. It may be stated that the maximum benefits resulting from the installation of a public water supply can be realized only by meeting the following conditions:

- 1st. The supply must be of adequate quantity;
- 2nd. It must be of good quality from a physical, hygienic and chemical standpoint;
- 3rd. Its development must be adequate, safe and economical.
- 4th. It must be maintained properly following its installation.
- 5th. It must be universally used.

The questions relating to quantity, quality and development are dependent upon preliminary study and the preparation of proper plans. The maintenance and use of the supply are, however, conditions which are subject to the control of the authorities in charge.

The benefit resulting from water supply installations may be measured by the improvement in the health of the community or by financial considerations. The improvement of health conditions is dependent primarily upon the quality of the water supply developed. If the supply is of good quality from physical, hygienic and chemical standpoints, is properly developed and is generally used, we may expect the maximum reduction in diseases resulting from water-borne infection. In proportion to the extent to which any of these features are deficient the improvement in health conditions will be lessened. It is frequently the case that a water supply of excellent sanitary quality but of objectionable physical or chemical quality is installed and on account of its unfavorable appearance is not used for drinking purposes. As a result, private wells continue to furnish water for this purpose and no marked improvement in health conditions results. Prejudice against public water supplies frequently contributes to prevent the general use of a supply entirely satisfactory. In such cases the maximum benefits are not realized. The method of development of a water supply of good quality may frequently determine the advantages to be derived, for instance, a ground water supply of a high degree of purity may deteriorate by storage in an uncovered pump well or reservoir. Algal growths may cause tastes and