

very difficult to enforce payment of other similar bills. If a complainant feels that the water department is lax, he will not exert himself to keep his fixtures in repair. If, on the other hand, the water officials are known to be severe and exacting, and absolutely impartial, the majority of the consumers will be satisfied that there is an advantage in being on the alert. The minority, it is true, will complain and accuse the manager or other executive of unfairness, but the fact that everyone has been treated alike and that there are no favorites will permit a very successful operation of the "no reduction on account of leakage" policy. Oak Park speaks from experience. Better to allow a lower rate on the water, approaching the cost per thousand gallons in the case of unavoidable leakage; or else adopt a partial-payment plan or both. But charge for every gallon wasted. The lesson will strike home and be appreciated throughout the community.

Waste Surveys in Oak Park

In making waste surveys the most convenient method is to make, first, a rough survey of the entire city by means of the Pitometer. This is done by isolating certain districts by closing gate valves and measuring the supply through one of the mains left open to serve as a feeder. It is possible on small systems to make the preliminary test by shutting down those districts entirely for a few minutes, especially in the residential sections, and note the drop in the rate of consumption as indicated by the recording chart at the pumping station or reservoir or wherever the master meter may be located, providing it is on the distributing system.

It is often found, however, in districts which are completely metered that the velocity of the smallest feed main is so low that it is impossible to obtain an accurate record of the consumption if there are no large leaks. It is then necessary to by-pass the flow of water through a small pipe, 2 ins. or smaller in diameter, in order to increase the velocity. This is commonly called the hydrant-and-hose method because the most practical way of doing it is to feed from a fire hydrant, without the district, through a fire hose to a hydrant within the district. Oftentimes a regular displacement meter is used and the rate is obtained by noting the readings of the meter at regular intervals. This method is not a very useful one owing to the fact that several drafts may occur during the test. In Oak Park two other methods have been used: One consisting of a 2-in. Venturi meter with a $\frac{5}{8}$ -in. throat which can accurately record rates from 3 gallons to 50 gallons a minute. The other is by means of Pitometers inserted into short pieces of pipe 2 ins. or smaller. Thus a quantity as low as $\frac{1}{4}$ of a gallon per minute can be measured.

Tests Made During Day

Contrary to the usual method of making waste surveys, all tests are made during the daytime, after determining the best hours in which the flow is somewhat steady, for inspection of the Venturi meter at the pumping station. The districts tested varied between $\frac{1}{4}$ of a mile and 2 miles in length. By being able to watch the rate of consumption, it is rarely found necessary to be on the job for more than half an hour at a time in order to determine the minimum rate of consumption.

The exact population of the district tested is obtained as well as the average daily consumption through the domestic meters—the former from the prevailing school census and the latter from the water accounts. Thus an estimate of the legitimate rate exclusive of the underground leakage is determined. In all cases where there is not much leakage the normal pressure is maintained through 600 ft. of fire hose. In order to bring the reading within the limits of the manometer where the flow is abnormal the valve on the meter is throttled. In one case a rate of 60,000 gallons per day at 10 pounds' pressure in a stretch of pipe only one-half mile long was observed, the normal pressure in the mains being 45 pounds per sq. in. Subsequent investigation by means of the aquaphone disclosed six service leaks which wasted water into the sewer at the rate of 200,000 gallons a day. This meant a leakage per capita rate of 305 gallons per day, while the service meters

indicated only a total per capita consumption of 45 gallons, but after the repairs were made the leakage rate per capita dropped to 10 gallons a day.

Water Ordinance

In order to be able to operate the water department efficiently it is necessary that a comprehensive and workable water ordinance be adopted and followed to the letter. All the employees and officials should be able to follow a definite, unswerving policy with a minimum number of loopholes to be detected by skilful lawyers. The water ordinance is either legal or it isn't. If there be a number of rules which have become a dead letter or are so ambiguous that the executive does not attempt to enforce them because he feels that they would not hold in case of a lawsuit, they had better be tried out immediately or else repealed. The efficiency of a water department is greatly impaired if there is a conflict with other city laws, as in the case of many municipal plants.

Centralized Management

Just a word on the final factor in the control of the water system. It follows from the foregoing paragraphs that all the divisions connected with the operation of large water departments must be under centralized management. It would be better if many municipal plants were made an independent branch of the municipal government. There would then be fewer failures in the operation of municipally owned utilities; failures which are concealed by taxes. There is a little incentive for efficiency in operation if the superintendent or manager makes a decision and is obliged to back down because the complainant is able to obtain a concession from another city official higher up, who is not vitally interested in the operation of the department. It is discouraging if the manager has outlined policies which resulted in a saving to the department and finds that the gains made are taken advantage of by some other municipal division which is not operated efficiently; or used because other funds have been exhausted. It is impossible to prevent needless waste of water against the advice of the manager, or if the manager is continually compelled to yield to pressure from some political adherent of the city fathers.

In the case of complaints on account of high bills, it is disconcerting to attempt adjustments and give satisfaction if the money is collected in one department, "shut-offs" for non-payment of bills handled in another and the meters read and accounts rendered in either of the foregoing or yet in a third one, all these different divisions being independent and under different executives. Unless all policies originate in the same department, there will be neither co-operation nor co-ordination.

The Canadian National Exhibition will open its gates August 23rd, but the formal opening will not take place until Monday, when H.R.H. the Prince of Wales will preside over the inaugural ceremonies.

The Jos. Dixon Crucible Co., of Jersey City, N.J., announces that for the past two years it has invested in Canadian government, provincial and municipal bonds all of its cash returns from sales of its products in Canada. This is an example which, if followed by all of the other American firms doing business in Canada, would be of benefit to Canadian finance. A. R. MacDougall & Co., Ltd., of Toronto, are the Canadian representatives for the Dixon pencils. The Canadian Asbestos Co., Montreal, are the representatives for the Dixon paints and lubricants.

The enforcement of regulations governing the practice of surveying and civil engineering in Idaho now comes under the Commissioner of Law Enforcement, R. O. Jones, Boise, Idaho. There is now a law regulating the practice of civil engineering in Idaho which appears to include all branches except mining and metallurgy. Examination for civil engineers will be held the second Tuesday in September; for surveyors, the first Tuesday in September. No survey of land or plat of same has been legal since June 1st, 1903, unless made by a licensed surveyor.