The secondary element is, essentially, a revolution counter. The primary and secondary elements are combined into one unit.

For steam metering, the shunt meter is an example of the velocity type. This unit is connected directly in 2, 3 and 4 in. pipe lines. Larger size mains are metered by installing a 2 in. meter in a bypass with a restricting orifice in the main line.

Selection of Meter

In selecting a meter for a particular installation, the number of different makes and types of meters suitable for the job is usually limited by one or more of the following considerations: (1) Its use in a new or an old installation. (2) Method to be used in charging for the service. (3) Location of the meter. (4) Large or small quantity to be measured. (5) Temporary or permanent installation. (6) Cleanliness of the fluid to be measured. (7) Temperature of the fluid to be measured. (8) Accuracy expected. (9) Nature of flow: turbulent, pulsating, or steady. (10) Cost. *a.* purchase price, *b.* installation cost, *c.* calibration cost, *d.* maintenance cost. (11) Servicing facilities of the manufacturer. (12) Pressure at which fluid is to be metered. (13) Type of record desired as to indicating, recording or totalizing. (14) Stocking of repair parts. (15) Use of open jets where steam is to be metered. (16) Metering to be done by one meter or by a combination of meters. (17) Use as a check meter. (18) Its facilities for determining or recording information other than flow.

STEAM REQUIREMENTS

Methods of estimating steam requirements for heating various types of buildings are given in Chapter 11.

Table 8 in Chapter 11 represents information obtained from all sections of the United States, and the group of buildings from which the information was taken represents a cross section of all types of heating systems.

Steam requirements for water heating can be satisfactorily estimated by using a consumption of 0.0025 lb per day per cubic foot of heated space for office buildings, without restaurants, and 0.0065 lb per day per cubic foot of heated space for apartment buildings.

Complete information on water heating requirements is given in Chapter 46.

Additional data on steam requirements of various types of buildings in a number of cities may be found in the Handbook of the *National District Heating Association*.

RATES

Fundamentally, district heating rates are based upon the same principles as those recognized in the electric light and power industry, the main object being a reasonable return on the investment. However, there are other requirements to be met; the rate for each class of service should be based upon the cost to the utility company of the service supplied and upon the value of the service to the consumer, and it must be between these two limits. District heating rates should be designed to produce a sufficient return on the investment regardless of weather conditions,

although existing rate schedules do not conform with this principle. Lastly, the rate schedule must be reasonably simple and understandable.

Glossary of Rate Terms

Load Factor. The ratio, in per cent, of the average hourly load to the maximum hourly load. This is usually based on a one year period but may be applied to any specified period.

Demand Factor. The relation between the connected radiator surface or required radiator surface and the demand of the particular installation. It varies from 0.25 to 0.3 lb per hour per square foot of surface.

Diversity Factor. The ratio of the sum of the individual demands of a number of buildings to the actual composite demand of the group.

Types of Rates

1. Flat Rates.
   - *a.* Radiator surface charge. *Obsolescent.*
2. Meter Rates.
   - *a.* Straight-line.
   - *b.* Step. *Obsolescent.*
   - *c.* Block.
     - (*a*) Class rates.

Straight-Line Meter Rate. The price charged per unit is constant, and the consumer pays in direct proportion to his consumption without regard to the difference in costs of supplying the individual customers.

Block Meter Rate. The pounds of steam consumed by a customer are divided into blocks of thousands of pounds each, and lower rates are charged for each successive block consumed. This type of charge predominates in steam heating rate schedules for it has the advantage of proportioning the bill according to the consumption and the cost of service. It has the disadvantage of not discriminating between customers having a high load factor (relatively low demand) and those having a low load factor (relatively high demand). The utility company must maintain sufficient capacity to serve the high demand customers and the cost of the increased plant investment is divided equally among the users, so the high demand customers are benefited at the expense of the others.

3. Demand Rates.
   - *a.* Flat demand.
   - *b.* Wright.
   - *c.* Hopkinson.
   - *d.* Doherty (or Three charge).

Demand Rates. These refer to any method of charge based on a measured maximum load during a specified period of time.

The *flat demand rate* is usually expressed in dollars per thousand pounds of demand per month or per annum. It is based on the size of a customer's installation, and is seldom used except where a meter is not practicable.

The *Wright demand rate* is similar in calculation to the block rate except that it is expressed in terms of hours' use of the maximum demand. It is seldom used but forms the basis for other forms of rates.

The *Hopkinson demand rate* is divided into two elements:

(*a*) A charge based upon the demand, either estimated or measured.

(*b*) A charge based upon the amount of steam consumed.

This rate may be modified by dividing the quantities of steam demanded and consumed into blocks charged for at different rates.