movement of the plug is transmitted by means of a lever to a pencil or marker which records the flow on a graduated strip chart.

Head meters are those in which the stream of fluid creates a difference of pressure, or differential head. This head is created by an orifice, Venturi tube, flow nozzle, or Pitot tube, and will depend upon the velocity and density of the fluid. The secondary element must contain a differential pressure gage, which will translate the pressure difference into rate of flow or total flow. This mechanism may be either mechanical or electrical. The electric flow meter has the advantage of being able to locate the instruments at some distance from the primary element.

Fig. 7 is a typical example of an orifice-type meter installation. A few general points to be considered in installing a meter of this type are: (1)

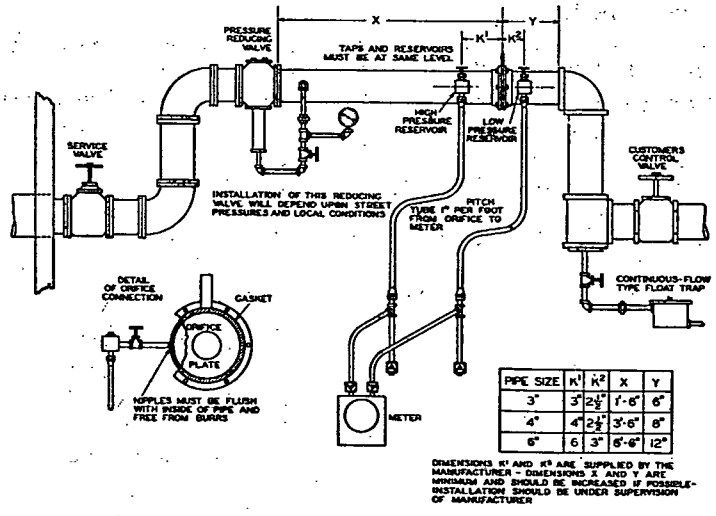

FIG. 7. ORIFICE METER STEAM SUPPLY CONNECTION

it is desirable to place the differential medium in a horizontal pipe in preference to a vertical one, where either location is available; (2) reservoirs should always be on the same level and installed in accordance with the instructions of the meter company; (3) the meter body should be placed at a lower level than that of the pressure differential medium—special instructions are furnished where the meter body is above; (4) meter piping should be kept free from leaks; (5) sludge should not be permitted to collect in the meter body; (6) the meter body and meter piping should be kept above freezing temperatures; (7) it is best not to connect a meter body to more than one service; (8) special instructions are furnished for metering a turbulent or pulsating flow.

Velocity meters are those in which the primary element is some device that is kept in continual rotation by the linear motion of the stream. 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 by-pass 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, *i.e.*, 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; (19) whether or not the condensate can be returned to a central point.

STEAM REQUIREMENTS

Methods of estimating steam requirements for heating various types of buildings are given in Chapter 17.

Table 7 in Chapter 17 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) (cu ft of heated space) for office buildings, without restaurants, and 0.0065 lb per (day) (cu ft of heated space) for apartment buildings.

Complete information on water heating requirements is given in Chapter 48.

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 always conform to this principle. Lastly, the rate schedule must be reasonably simple and understandable.

Glossary of Rate Terms

Load Factor. The ratio, in percent, 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 (hr) (sq ft of surface).