loose insulating material to the sectional insulation is, of course, optional and is justified only where high pressure steam is used.

(E) and (F) are conduits used by two district heating companies, and have the advantage of being constructed of common materials.

Conduit (G) is of cast-iron construction, assembled with lead joints and is water-tight, if properly laid. It is obviously expensive and is justified only in exceptional cases.

Since it is difficult to make a concrete or masonry conduit absolutely water-tight, provision should be made for some seepage. The pipe should be protected by a waterproof jacket over the insulation and the seepage drained from the inside of the conduit. Underdrainage of the conduit is

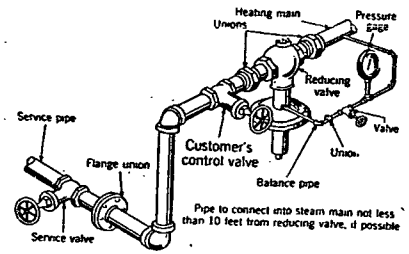

FIG. 2. CONNECTIONS FOR REDUCING VALVE WITHOUT BYPASS

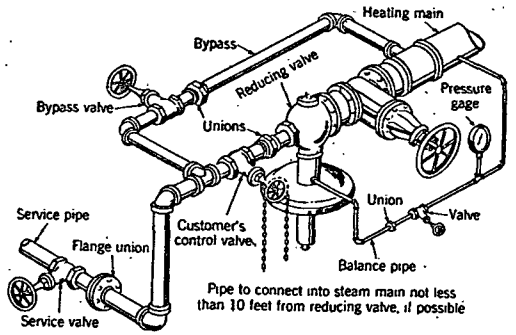

FIG. 3. CONNECTIONS FOR REDUCING VALVE WITH BYPASS

generally provided for by a tile drain laid in crushed stone or gravel underneath the conduit. The tile underdrain should be carried to the sewer or some other drainage point. Manholes are required at intervals for access to valves, traps, and some types of expansion joints.

Where steam and return piping are installed in the same conduit, the return piping usually follows the same grade as the steam piping. In general, the condensation is pumped back under pressure.

Where it is possible to use basement or sub-sidewalk space for the distribution piping the cost of installation and maintenance is greatly reduced.

PIPE TUNNELS

Where steam heating lines are installed in tunnels large enough to provide walking space, the pipes are supported by means of hangers or

roller frames on brackets or frame racks at the side or sides of the tunnel. The pipes are insulated with sectional pipe insulation over which is placed a sewed-on, painted canvas jacket or a jacket of asphalt-saturated asbestos water-proofing felt. The tunnel itself is usually built of concrete or brick and water-proofed on the outside with membrane water-proofing.

Because of their relatively high first cost as compared with smaller conduits, walking tunnels are sometimes omitted along heating lines unless they are required to accommodate miscellaneous other services or provide underground passage between buildings.

OVERHEAD DISTRIBUTION

In some industrial and institutional applications, the distribution piping may be installed, entirely or in part, above ground. This method

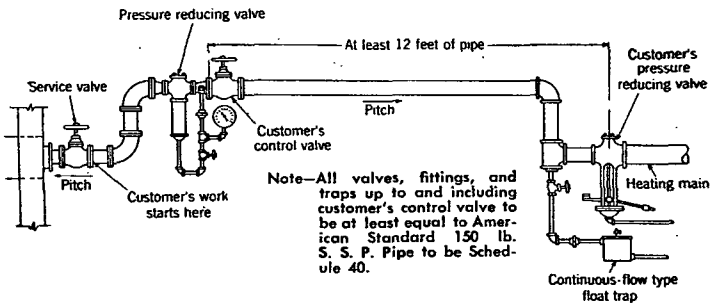

FIG. 4. STEAM SUPPLY CONNECTION WHEN USING TWO REDUCING VALVES

of construction has the advantage of requiring no excavation and being easily maintained.

INSIDE PIPING

Figs. 2 and 3 show typical service connections used for low pressure steam service.

Fig. 2 shows installation of a reducing valve without a bypass, which is usually omitted in the case of smaller size valves.

Fig. 3 illustrates the use of a reducing valve, with a bypass which is generally provided for larger installations. This latter construction permits the operation of the line in case of failure in the reducing valve. In the smaller sizes, the reducing valve can be removed, a filler installed, and the house valve used to throttle the flow of steam until repairs are made.

Fig. 4 shows a typical installation used for high pressure steam service[1]. The first reducing valve effects the initial pressure reduction. The second reducing valve reduces the steam pressure to that required.

In a heating system the pipes carrying condensate are more subject to corrosion than other parts of the system. Care must be taken to give proper pitch to the pipes and provide proper venting of non-condensable gases. (See Chapter 51, Corrosion).

Most district heating companies enforce certain regulations regarding the consumer's installation, partly to safeguard their own interests but principally to insure satisfactory and economical service to the consumer.