

type, modified to suit the service requirements, and are often arranged with graduated heads and lever handles in order to indicate the relative opening of the valve port in any position.

CORROSION

The electrolytic theory of corrosion, as formulated in 1903 by Dr. Whitney, led to the development of certain protective methods for closed water systems, which are based on the removal of dissolved oxygen from the water. Careful experiments in various research laboratories have demonstrated that the amount of corrosion found in such systems is almost directly proportional to the amount of oxygen in solution, and varies with the temperature and rate of flow. The composition of the water also has a bearing on the rate of attack.

All reliable data on this subject indicate that the composition of the iron—i.e., the varying amounts of carbon, phosphorous, manganese, sulphur, silicon, copper, etc., usually found in wrought iron and soft steel—makes very little difference in the amount or character of corrosion under water, although under atmospheric exposure the influence of composition is more marked. Corrosion is stimulated by scale adhering to the iron surface, by electric currents from external sources, by acids carried in solution or as gases, by solids that break down in water, by strains due to un-uniform or inadequate annealing and by contact between dissimilar materials.

The best way to deal with a corrosive water supply is to treat it at its source. In practice, oxygen removal has been accomplished in two ways, (1) by de-aerating the water mechanically and (2) by fixing the free oxygen by chemical combination. Suitable apparatus for this purpose is now on the market. Corrosive action may be retarded by the use of a metal which is electro-positive to that to be protected, such as zinc to protect iron; by the effective neutralization of acid or alkaline contents; by the elimination of un-uniformity in the materials used; and through the exercise of care in counteracting the effects of stray electric currents.

The introduction into piping systems of various chemical compounds, usually for forming a protective coating of thin deposit has apparently been rewarded with some success. Non-ferrous piping may deteriorate rapidly unless selected with due regard to the service conditions to which it will be subjected. The composition and micro-structure are items of special importance. Electrolysis set up by joining copper alloys to iron must be guarded against.

Piping exposed to elements or buried in the ground is quite successfully protected by coatings of the asphaltic type, usually applied hot. These coatings are often reinforced with fabric wrappings. Galvanizing by the hot-dip process and painting with specially prepared mixtures also afford satisfactory protective safeguards.

PIPE WELDING

Arc welding and oxy-acetylene welding are used with equal success in piping work. Since "the weld is only as good as the welder," care should be exercised in the selection of the operator. Obviously an operator who

is constantly working at his trade is usually better qualified than one who uses the torch or arc only at intervals. Consequently a separate crew or crews must be supplied in most cases. This fact should be considered when comparing the cost of a welded installation with the same installation made with screwed or flanged joints.

To date welded piping has been found practicable and less expensive than piping made with screwed or flanged joints on sizes down to 2 in., provided the job is sufficiently large to warrant the supplying of a skilled

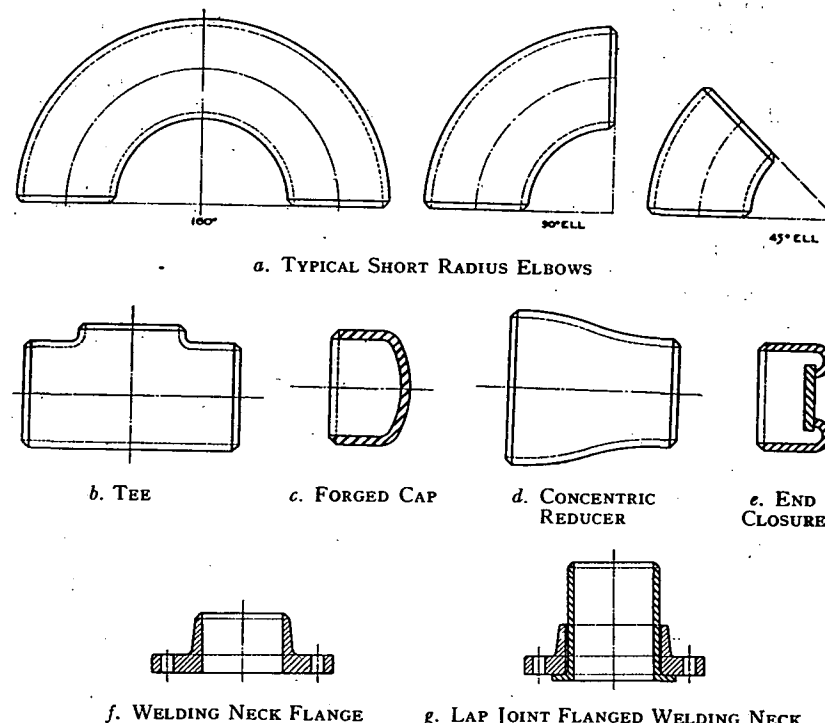


FIG. 2. WELDING FITTINGS

mechanic together with the transportation of equipment, etc. Smaller sizes can also be welded to advantage but there must be a relatively greater amount of welding in order to make a favorable cost comparison. The lowest costs can be obtained where the job is sufficiently large to permit the use of separate crews, one to place and line up material and the other to weld the material already properly placed. The less the work of these two crews overlaps, the lower will be the installation costs. With the application of pipe bending and welds all branches and all changes in direction can be made with long-sweep turns, thereby reducing friction at the bends.

Whenever a branch is joined to a main the use of standard tees for