

supply of steam. If the water is heated electrically, the thermostat throws an electric switch to control the heater elements.

Fig. 9 shows the thermostat and diaphragm valve on a storage water heater. The removable head of the heater has separate supply and return compartments which serve the heat transfer surfaces inside the tank, and which must be easily removable for cleaning. The supply piping must be provided with drains or traps arranged so that whether the steam valve shown in open or closed no condensation can accumulate ahead of it. A hand valve should be installed alongside the automatic valve. (See also Figs. 10 and 11).

When automatic fuel burners are employed, as in residences, the one burner through a system of controls readily may heat both the house and the hot water for domestic purposes. In most installations, this makes it unnecessary to install two separate fuel burners. Fig. 6 illustrates such a scheme.

BATH AND SHOWER CONTROL

The temperatures for the home bath or shower are usually controlled manually by mixing valves which combine the streams of water of different temperatures. In clubs and many hotels, as also in public buildings and factories, there has come into use, not only for convenience, but as a safety measure, thermostatic control at the showers of the mixing-valves to prevent excess temperatures.

MANUFACTURING

The ever-increasing demand for perfection in everything that contributes to the daily needs of a modern people is being met by the great host of manufacturers through the employment of *just the right heat* in the making of their products.

Factory-prepared foods and canned goods are invariably cooked or pasteurized at most exacting temperatures. A degree or two of excess heat may break down or otherwise impair the quality, while a very small margin of insufficient temperatures may permit many harmful organisms to remain alive in the food. The eternal vigilance of automatic heat control is an ever-increasing factor in the food industry.

Synthetic fabrics and other materials from which clothing are made go through temperature processes, which in many cases require fractional degree automatic heat control.

The manufacture and preservation of many building materials employing wood or vegetable fibres necessitate very high and carefully controlled temperatures. The ceramic industry which supplies all the earthenware creations found in our modern bathrooms is wholly dependent on the most exacting temperature regulation in the kilns. The slightest deviation from the right temperatures is sufficient to cause rejection of large percentages of the product.

A list of the manufactured articles which depend on automatic heat control for their production and perfection would include nearly everything which contributes to the pleasure and the profit of civilization.

CHAPTER 18

PIPE AND FITTINGS

Kinds of Pipe; Corrosion; Coatings; Cast Pipe; Wrought Iron Pipe; Thread Cutting; Welding Methods; Standards.

THE factors which control the characteristics and properties, and thus produce the modern improvement in various tubular materials, are the facilities of the manufacturer; the special processes employed; the availability and quality of raw materials and the ideals and skill of the men in the organization.

Ferrous Piping

Among modern improvements none have received greater attention than the efforts to produce a uniform quality of wrought pipe. To secure and maintain uniformity, necessitates complete control of all materials and manufacturing operations—from ore to finished product. This practice of producing uniform skelp and its fabrication into finished tubular products is supplemented by a mechanical process of roll-knobbing, to make the metal more uniformly dense when there is any tendency to physical irregularity in this respect.

Another condition which gives rise to electrolytic centers and pitting is the presence of irregular areas of heavy welding-scale on the surface of the finished product, caused by oxidation at the high temperature of welding. This scale is strongly electro-negative to iron, like copper, and should, therefore, be removed in the interest of preventing corrosion.

Other advantages of having the welding scale removed from pipe are: Its clean, smooth surfaces present an ideal base for the adherence of a galvanizing coating, full working capacity is assured (the interior being free from any obstructions tending to reduce the flow), troubles caused by the deposit of scale in valves, strainers, and other apparatus, are practically eliminated and pitting by corrosion is materially reduced.

Scale removal, where accomplished in the process of manufacture, is done by passing the oversize pipe through a series of finishing rolls (after its temperature has been reduced to about 1,800 deg. fahr.) which rolls reduce it to the proper size and also crack the hardened welding-scale from both the inside and the outside of the pipe. The loose scale is then washed or blown off. While with such expedients considerable improvement has been attained, the fact still remains that the life of pipe is governed largely by installation conditions, and no matter how well made or uniform the pipe may be, its life, particularly under severe corrosion conditions, such as must be met in hot water-supply lines and in boiler feed and return lines, is limited, and some protective measures are necessary to secure a longer life.