appliance enjoys uninterrupted and efficient service from it. It is common practice among gas companies to make periodical inspections of the heating appliances on their lines and some even go so far as to light the pilots when the heating season approaches so that the appliance stands ready to respond to the thermostat's call for heat when cool weather comes.

A notable development of comparatively recent date is the offering of gas burning boilers designed with the object of meeting the requirements peculiar to large scale heating. Compact, automatic in operation, and with large steam releasing area and storage space; these large unit boilers are adaptable to the heating requirements of office buildings, college buildings, and hospitals; as well as to the production of large amounts of low pressure steam for industrial and process work.

TYPES OF GAS HEATING APPLIANCES

Gas burning heating appliances in general use may be classified as follows:

1. Central heating plants:
   - *a.* Steam heating boilers
   - *b.* Water heating boilers
   - *c.* Warm air furnaces
2. Room (or space) heaters:
   - *a.* Radiant heaters (blue flame)
   - *b.* Reflector heaters (luminous flame)
   - *c.* Convection type unit heaters.

CONVERSIONS VERSUS ORIGINAL INSTALLATIONS

(for central heating plants)

During the years when gas heating was limited to those localities where a cheap supply of natural gas was available, practically all installations were what are termed *conversions*. By conversion is meant an appliance designed to burn coal, with gas burners inserted. This practice, however, has not been followed in manufactured gas territory, for certain definite and scientific reasons; and the increasing price of natural gas eventually will bring it to an end in that territory.

No two fuels burn and give off heat in exactly the same manner; and no two fuels differ so widely in this respect as do coal and gas. In coal boilers or furnaces, the path traveled by the hot gases is relatively short. Most of the heat made available by the combustion of coal is given off as radiant energy by the incandescent coke and flame. This radiant energy is absorbed very rapidly by the heating surfaces which are so placed that they can *see* the fuel bed and flame. Very little remains to be absorbed by the heating surfaces that are placed farther on in the boiler or furnace. A coal burning appliance is therefore designed with a large combustion chamber with heat-absorbing walls so placed that they will *see* the heat radiating flame. Close confinement of the products of combustion is not necessary except in the last passes of the appliance.

Gas, on the other hand, burns most satisfactorily and most completely when air is mixed with it previous to ignition. The resultant flame is

blue, as in the familiar Bunsen burner. A blue flame has very little radiating power. The combustion is complete within a few inches of the burner. After combustion is complete, the hot gases must immediately be brought into close contact with the heat-absorbing surfaces and kept in contact with them until the maximum possible amount of heat has been absorbed. A gas burning appliance is therefore designed with a small combustion chamber and with many thin passages for the hot gases to pass through so that they can be brought into intimate contact with the heat absorbing surfaces.

In order for gas to be burned with reasonable economy in an appliance designed for coal, an intricate baffling arrangement must be built up within the combustion chamber so that the products of combustion will be caused to wipe over the walls of the combustion chamber. Even when this is done, the appliance will not generally develop its full rated output with economy because it will not have sufficient indirect heating surface beyond the combustion chamber so arranged that it will break the gas up into the fine streams necessary to insure complete heat absorption. Appliances for gas burning must be so designed that each particle of hot gas is brought very close to a heat absorbing surface. The general practice of gas companies interested in heating is to discourage conversions.

GAS BOILERS

Gas boilers have taken on a well defined form just as coal boilers have. The usual boiler is sectional in construction with a number of independent burners placed beneath the sections. In most boilers each section has its own burner. Some makers fashion their sections so as to give the effect of a horizontal tubular boiler so as to accelerate water circulation. Other makers either do not incorporate the tubular feature in their designs or depend on internal baffling to give the tubular effect. In all cases the sections are placed very close together, much closer than would be possible with any soot forming fuel. Extended heating surfaces, such as lugs, pins, or fins are features of some designs. In all cases, the effort of the designer is to break the hot gas up into thin streams.

Because there is no fuel bed resistance and because the gas company supplies the motive power to draw in the air necessary for combustion (in the form of the initial gas pressure) draft losses through gas boilers are low. A gas boiler will therefore operate with a very slight draft, thus making it possible to operate at very low stack temperatures. Terminal temperature differences as low as 50 deg. are not uncommon.

All gas boiler designers strive to make their product as light as is compatible with strength and to render all heating surfaces easily accessible for cleaning.

INSTALLATION AND CONTROL OF BOILERS

One feature of the piping installation that adds to the satisfactory service rendered by gas boilers is provision for adequate and rapid venting of the air from steam heating systems. It is particularly necessary that the air vent out freely when a gas control that either permits the gas to burn at full rated amount, or shuts it off completely, is used. This