

smoke. The smoke produced is a good indicator, and that opening is best which reduces the smoke to a minimum. Too much secondary air will cool the gases below the ignition point, and prove harmful instead of beneficial.

The following suggestions will be helpful:

1. In cold weather, with high combustion rates, the secondary air damper should be half open all the time.
2. In very mild weather, with a very low combustion rate, the secondary air damper should be closed all the time.
3. For temperatures between very mild and very cold, the secondary air damper should be in an intermediate position.
4. For ordinary house operation, secondary air is needed after each firing for about one hour.

Draft Required for Burning Solid Fuels

The draft required to effect a given rate of burning the fuel as measured at the smokehood is dependent on the following factors:

1. Kind and size of fuel.
2. Combustion rate per square foot of grate area per hour.
3. Thickness of fuel bed.
4. Type and amount of ash and clinker accumulation.
5. Amount of excess air present in the gases.
6. Resistance offered by the boiler passes to the flow of the gases.
7. Accumulation of soot in the passes.

Insufficient draft will necessitate additional manipulation of the fuel bed and more frequent cleanings to keep its resistance down. Insufficient draft also restricts the control by adjustment of the dampers.

The quantity of excess air present has a marked effect on the draft required to produce a given rate of burning, and it is often possible to produce a higher rate by increasing the thickness of the fuel bed. Fig. 4 shows the relations for the same rate of burning between the draft required and the CO_2 content of the gases for a large and a small boiler.

Combustion of Anthracite Coal

An anthracite coal fire should never be poked, as this serves to bring ash to the surface of the fuel bed, where it melts into clinker.

Grate size anthracite coal is suitable for large grates and for a fuel depth of 20 in. or more. The air spaces are large; the amount of surface in contact with the air is small, and consequently combustion is slow. Lumps of rock or slate, being large, may cause trouble in shaking the grate. On grates 25 in. and under, the fire is likely to go out easily with this fuel, unless mixed with small size coal for reducing the air spaces.

Egg size is suitable for large firepots (grates 25 in. and over) if the fuel can be fired at least 20 in. deep. The air spaces between the pieces of coal are large and normal combustion is slower than with the next smaller size coal. Pieces of rock and slate sometimes may be large enough to cause some trouble in shaking the grate. For best results this coal should be fired deep.

Stove size coal is the popular size of anthracite fuel for most boilers

and furnaces used for heating buildings. It is small enough to burn well on 17 in. grates, but large enough so that the draft loss through the fuel bed is not too great. The only instructions needed for burning this type of fuel are:

The grate should be shaken before each firing; the fire should never be poked from the top; the fuel should be fired deeply and uniformly.

Chestnut size coal is in demand for firepots up to 20 in. in diameter, especially those in which the fuel cannot be fired over 15 in. deep. The

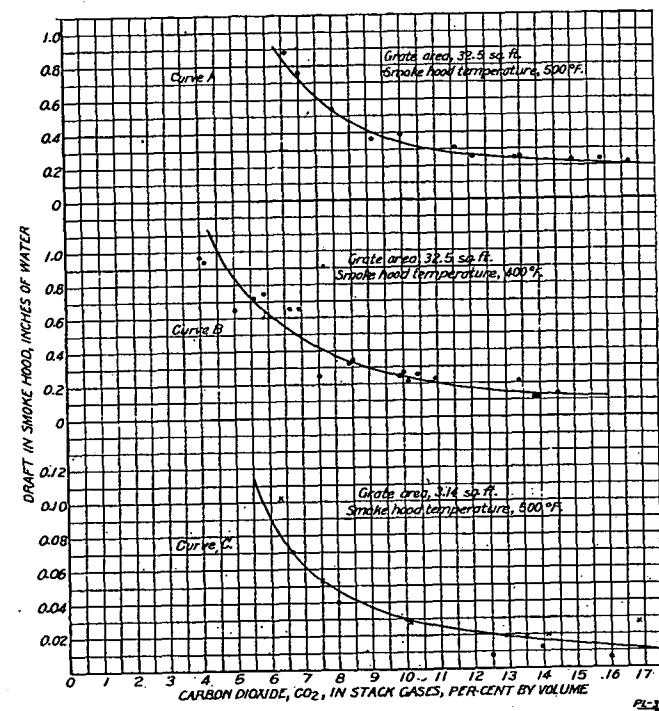


FIG. 4. RELATION BETWEEN DRAFT IN SMOKE HOOD AND PER CENT CO_2 IN FLUE GASES WITH A CONSTANT FLUE GAS TEMPERATURE

percentage of ash is usually higher than in stove coal, but the pieces of rock and slate are small and do not interfere with the shaking of the grates.

Pea size coal is often an economical fuel to burn. It is relatively low in price. When fired carefully, pea coal can be burned on standard grates. It is well to have a small amount of a larger fuel on hand when building new fires, or when filling holes in the fuel bed. Care should be taken to shake the grates only until the first bright coals begin to fall through the grates. The fuel bed, after a new fire has been built, should be increased in thickness by the addition of small charges until at least