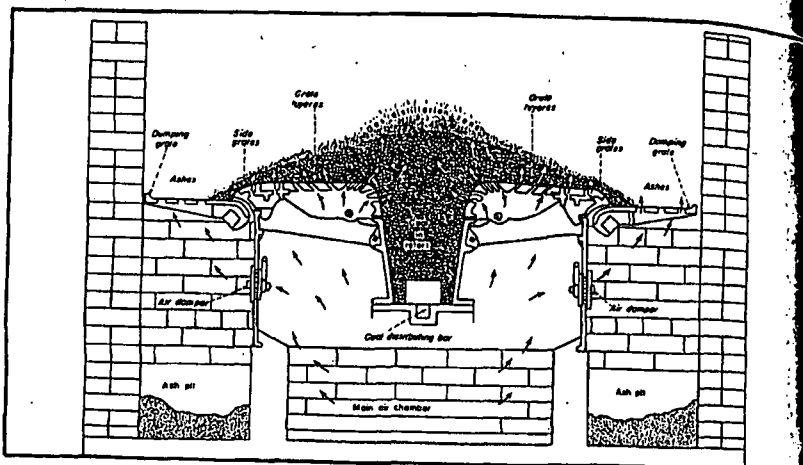
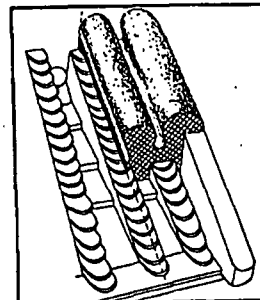
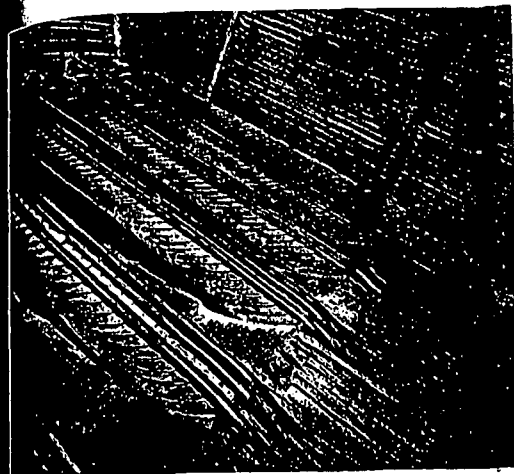




1 Single-retort stokers introduce coal through a central feeding trough. The coal moves along the furnace by ram action, sideways by gravity and pressure of incoming coal. Air supply passes through grates and fuel bed under pressure.



2 Hills-and-valley contour characterizes the multiple-retort fuel bed. Heavy hills of coal cover retort section. Thin valleys lie over tuyeres.

3 Watercooling of underfeed stoker's fuel bed is said to (1) extend the fuel flexibility (2) reduce the maintenance (3) reduce the clinker formation.

Underfeed Stokers Are Meant to Operate Smokefree



Do your part and they'll do theirs. Underfeed stokers are inherently free of cinder and flue-dust problems, but poor operation or overloading upsets this condition. Here are facts you need if operation, fuels, firing are to stay troublefree.

By L N ROWLEY, Managing Editor, and J C McCABE, Assistant Editor

► OUR LAST ARTICLE looked into fuel-bed firing (POWER, March 1948, p 88). Of the two mechanical forms—overfeed and underfeed—it dealt with overfeed firing only. Underfeed stokers, which we consider here, represent one of the more widely used means for firing bituminous coal.

To set up guides for good, smokefree operation, let's take up (1) the stoker itself and (2) the combustion process.

Underfeed stokers come in two broad classifications—the single retort and the multiple. The single retort works with units up to a steaming capacity

of 25,000 lb per hr, and sometimes as high as 40,000. Multiple-retort units are in service for capacities from 30,000 up to 500,000 lb per hr.

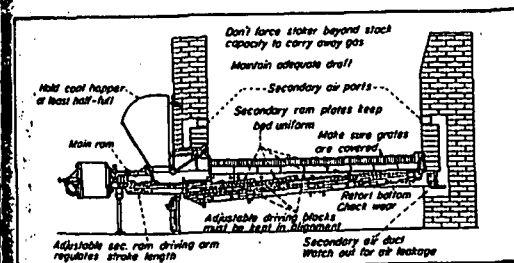
Single-retort designs follow three basic forms. All employ a central retort, Fig. 1. Two have stationary fuel grates on each side of the central retort, and the third has mechanically actuated moving grates on either side.

Types one and two differ principally in ash removal. The first, now employed on small units only, has dead plates at the extreme sides. Ash is removed by hoe through the furnace

doors. The second has ash-dumping grates at these extreme sides and collecting pits under each grate.

The third type with moving fuel-burning grates employs ash-dumping or discharging grates at the extreme furnace sides and ash-collecting pits. One word of caution on fuels: Double screening to reduce fines is advisable for single-retort stokers equipped with stationary grates.

Here's how combustion takes place. The central retort serves as a feeding trough or supply channel for introducing coal beneath the fuel bed



Spotted here are various equipment points to check in keeping either single or multiple-retort stokers operating in the way that they should—smokefree.

A ram, plunger or movable-retort bottom with the aid of secondary reciprocating elements (or in other models a screw-feed system) pushes coal rearward and upward to the fuel-burning grates. Coal feed is usually varied by changing time of feed stroke and leaving length of stroke always the same. Incoming coal leaves the retort and travels over the grates toward the side-

walls. With stationary grates its movement depends in part on gravity and for the rest on the pressure of additional incoming coal. Mechanically moving grates add to these forces.

Air supply passes through the grates and fuel bed under pressure. Since the grates usually extend into the retorts a short distance, incoming air also passes through the top section of the fuel sup-

ply to perform some drying of wet coal.

There is a certain amount of zone-feed for incoming air. It is accomplished by various air-chamber arrangements or hollow grates to give an even fuel-bed distribution. But the majority of the air goes up through the fuel bed close to the retort. At this point it serves the useful purposes of promoting (1) rapid ignition (2) maximum mixing between air and volatile released from the heated raw coal. Some installations put overfire nozzles in the rear or front walls for added turbulence.

The zone of active combustion covers all the grate area. With narrow stokers the active zone reaches the area directly above the retort itself. Usually, though, ignition starts where the coal passes beyond the retort boundaries. Burning progresses as coal travels towards the furnace sides.

Clinkering difficulties can develop along the sidewalls at the grate level if a coal having a lower ash-fusion temperature than the design one is substituted. Watercooled sidewalls reduce troubles from this source and thereby extend the range of suitable coals.

Furnace size should be ample for shortest flame travel. Furthermore, boiler and stoker should be coordinated. Shortest flame travel runs about 4 ft for small stokers and up to 8 for large-sized ones. An allowance of an