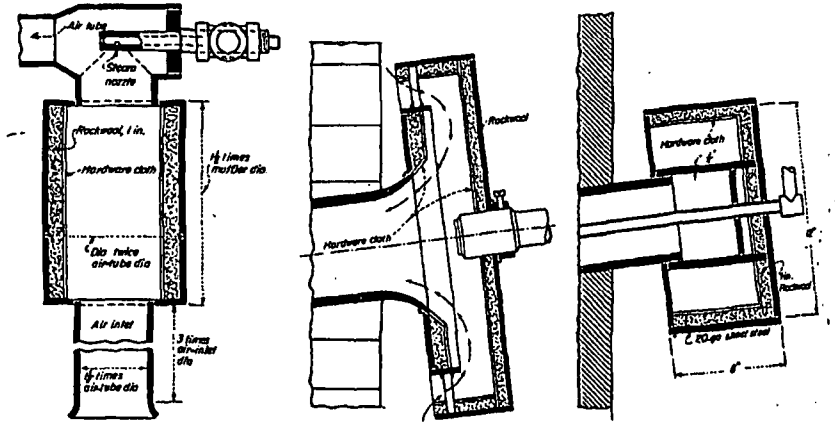
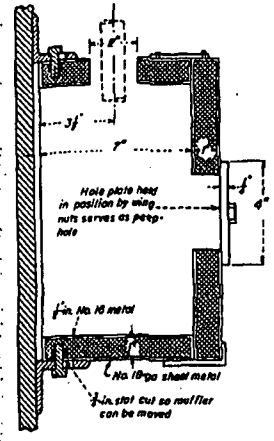
Equipping Overfire Jets With Mufflers Makes Them Silent Working Tools on a Boiler



1 Pulling air directly from a boiler-room produces an irritating noise

2 Mufflers lined with a soft and sound-absorbing surface will cut down noises

3 Making sure that the air passages are large assures unrestricted air flow



4 Removable muffler assembly makes jet-maintenance an easy-to-do job



Cut Smoke by Proper Jet

When you fire coal on a fuel bed by spreaders, underfeeds, chain or traveling grates you get best combustion efficiency in furnaces designed for the firing method. Once you change your firing method your furnace may need the help of overfire jets. Here's the latest data on locating and applying them

By L N ROWLEY
Managing Editor

and

J C McCABE
Associate Editor

OVERFIRE JETS as smoke-reducing tools have strong appeal for owners of boilers that are already operating. In *September (pp 78-81) we discussed* design of these jets. Here we get down to cases and talk about their effective application.

But before we get into actual applications let's stress again certain precautions, mentioned in September, that must be taken to make an installation successful. Unless a given boiler-unit requires continuous operation of jets that unit has to have either reliable automatic jet controls, preferably electronic, or a convenient indication for *acquainting the fireman with the density* of flue gas. No fireman will, or could be expected to, operate jets only as they are needed.

Once the decision to use jets has been made, steps must be taken to work them into the boiler room without creating unlooked-for problems. For example, an unmuffled steam jet delivering air from a boiler room produces a highly irritating noise. Several jet mufflers have been developed to correct this nuisance, Fig. 1-4.

Sample Muffler Designs. *Fairly simple* arrangements give as effective a muffling action as the normal boiler room requires. Soft surfaces for the inner lining of mufflers absorb irritating sound waves and reduce the objectionable noise level. In addition, ample passages through the muffler or silencer permit unrestricted air flow. Some installations employ a large duct leading from a remote corner or an air preheater to supply the jet. Air admission from such an out-of-the-way source cuts down the audible sound-level produced by air pulled into the jets.

Special jet applications, though, impose their own problems on muffler design. The only workable muffler for bridgewall mounting, for instance, seems to be a special manifold for steam distribution with steam nozzles carefully spaced, and accurately centered and positioned with a regard to the retorts. But such a jet location suffers from (1) difficulty of accurate mounting (2) high furnace-wall temperature in this zone (3) inaccessibility for jet cleaning.

This last item—jet cleaning—brings up the importance of good maintenance in getting top performance from jet and muffler assemblies. One large user of overfire jets has developed a set of recommendations that serve as a guide *to jet and muffler designs.* He recommends: Where single mufflers, Fig. 4, have been installed make muffler top removable so access to jets and air tubes is facilitated.

Where nozzles must follow close spacing use one continuous muffler. But allow access holes for each jet, as in Fig. 4.

Put an outward bevel on all nozzle tips. The bevel space permits mill scale to fall away from the orifice. This built-in cleaning action reduces the possibility of nozzles plugging up.

Make air-tube tips on the fire end out of a high-temperature metal, such as is used for soot-blower elements. Sections *of Dialoy soot-blower elements,* 6 in. long, work out well. *Such a metal* makes it possible to project the air tube slightly into the furnace. This projection cuts down the likelihood of slag covering the tube end. In addition, the high-temperature metal gives longer maintenance-free operation.

Jet Location. Unfortunately, few definite rules or guides exist for selecting proper *jet location. A number of typi*cal installations, Fig. 5-9, point up this fact. Some arrangements cover the full firebox quite well. Others are designed to meet and correct only a localized smoking condition, Fig. 9.

One technique advanced for spotting jets involves use of a bare steam nozzle attached to a steam hose. With this set-up, explore the firebox from as many openings as available. A close observation of location and effect that the bare steam nozzle produces on furnace smokiness helps to determine location of permanent jets. Most effective location will indicate furnace wall and approximate jet elevation above the fuel bed to produce best smoke elimination.

Traveling Grates. Usual application of jets to traveling-grate stokers follows the theory of rear-wall mounting, Fig. 6. The jets, it is felt, force the lean-furnace-gas mixture (heavy in air, light in hydrocarbons) characteristic of the rear portion of the grate into intimate contact with the rich, heavy hydrocarbon streams rising near the front wall or ignition region of the grate.

A more direct and reportedly highly effective application of jets to traveling grates makes use of the front wall. In this application, primary-air supply to the rear of the grate must be controlled to its lowest possible flow. Jets in the front wall supply a controlled amount of air directly to the hydrocarbon strata coming off the front of the grate. This gives a high degree of turbulence between air and furnace gas. It achieves the necessary intimate mixing between the volatiles released and the air.

Spreader Stokers. Front, back or side-wall locations give equal effectiveness with spreader stokers. Jets should introduce air not less than 18-24 in. above fuel-bed top. Since spreader stokers liberate hydrocarbons from coal particles in suspension, rather than from *the fuel bed, a higher secondary air* stream must be used to set up turbulence with the hydrocarbons. Jets, with velocities as recommended in the September issue, have little effect on coal distribution over the fuel bed even when directed into the coal stream leaving the spreader-stoker distributor itself.

To date no jet arrangement completely combats flyash carryover from spreader-stoker firing. Some reduction, in flyash emitted, results if jets are placed high enough to catch up suspended particles before they are swept up into the furnace passes.

Underfeed Stokers. Single- and twin-retort underfeed stokers (May 1948, pp *84-87) put out little or no smoke when:* (1) installation is according to recommendations (2) operation proceeds with average caution (3) fuel bed is not manually disrupted. Where smoke troubles do develop, a 35% overfire air, properly directed, gives excellent results. Jet location follows usual pattern outlined below under installations.

Multiple-retort stokers serve bigger furnaces and require somewhat more precise spotting of jets. Customary installation locates jets in the front wall, Fig. 7, with spacing adjusted to coincide with retort spacing. Each jet, then, discharges into the region directly above a retort where a reducing atmosphere frequently exists. Often jet penetration need only reach the length of the "hump" characteristic of underfeed-stoker fuel beds. Beyond this distance a better balance between combustibles and air reduces smoke troubles.

Specific Installations. A cast-iron sectional boiler usually requires a bridge-wall mounting. Fig. 5 shows just such an installation as recommended by the Chicago Dept of Smoke Inspection and