Oil Storage Tanks

Tank installations should always be made in accordance with local regulations, or in absence of these, the regulations of the *National Board of Fire Underwriters* should be followed. These latter regulations permit the oil to be fed by gravity from an exposed 275 gal. inside storage tank, if desired, and if proper precautions are taken to prevent an abnormal flow of oil. Inside tanks should be installed on non-combustible supports and located at least 10 ft. from the burner. In some localities it is permissible to install two 275 gal. tanks with a three-way valve in the feed line connecting the two tanks, permitting gravity feed from either tank. This type of installation has many advantages and is rapidly coming into favor with local authorities having jurisdiction over the installation of oil heating equipment.

For large installations a very desirable installation is with an outside buried tank of at least 1,100 gal. capacity. Where it is impractical to locate this tank below the level of the burner, it is necessary to use some means to prevent the siphoning of oil from the tank, in case of a break in the fuel supply line. There are several devices for this purpose which have been approved by the Underwriters' Laboratories. The use of a large buried tank eliminates the necessity of constantly watching the fuel supply, and in some cases will permit the purchase of fuel at enough lower price to pay for the difference in installation cost. All tanks should be provided with direct reading gages to give a constant check on the amount of fuel on hand. All tanks must be vented and should be located so that the filling line terminal is near the drive, or curb, to facilitate delivery from the tank truck.

Chimney Design

Although slightly less draft is required for oil burning equipment than is required for coal burning equipment, and a smaller chimney area ordinarily would be satisfactory, it is recommended that the chimney be designed to meet the boiler manufacturer's requirements as specified for coal burning. It is preferable to have the oil burner flue isolated from other flues as this may be helpful in preventing any mechanical sound from being transmitted to the rooms of the house. A well designed chimney that will insure uniform draft conditions is just as important to an oil burner as it is to a coal-fired heating plant. For further information on this subject, see Chapter 14, Chimneys.

INDUSTRIAL HEATING

Burners

Atomizing burners are used exclusively for installations with heavy oil. Of these, there are three types: steam atomizing burners, air atomizing burners, and mechanical atomizing burners.

The *steam atomizing* burner has two classifications, the outside mixing and the inside mixing type. With the outside mixing type, the oil is forced through an orifice at a comparatively low pressure and just as it emerges from this orifice it is struck by a jet of steam traveling at a high velocity from a direction at right angles with the flow of oil. The steam jet breaks the oil and injects it into the combustion chamber in a fine

spray or mist. The inside mixing type has a turbulence mixing chamber between the steam orifice and the burner opening. The mixing inside the burner permits some vaporization of the lighter hydrocarbons due to the heat in the steam, so that the mixture issuing from the burner-opening lights readily and maintains a steady burning flame. Steam burners require from 1.5 to 5 per cent of the total steam generated for atomization; 2 to 2.5 per cent being a good average. This average easily can be maintained by correct adjustment of the burners. For the best results the steam should be dry.

Air atomizing burners using high-pressure air are similar in design to those using steam. This type is not used as much as low-pressure air burners. Low-pressure air burners use comparatively large volumes of air under pressure of 1½ to 2½ lb. per square inch. If the blowers or compressors supplying the air are steam driven, they will require approximately 2½ to 3 per cent of the steam generated for the motive power, but the exhaust steam is available for use in the pre-heaters, so that the steam consumption for air atomizing burners compares very favorably with that for steam atomizing burners. The first cost, however, is greater with air atomization than with steam atomization.

Mechanical atomizing burners are those which atomize the oil without the aid of air or steam, although it is common practice to use air under low pressure in connection with mechanical atomizers further to atomize the fuel, though this is not essential. The high-pressure atomizer forces the oil through a small orifice under high pressures (100 to 200 lb. per square inch). The oil is given a rotary motion by slots cut tangentially to the diameter of the orifice of the burner, so that the centrifugal force of the oil leaving the orifice acts as an aid in atomizing the fuel.

Another type of mechanical burner is the rotary cup burner. In some burners the cup is positively driven by an electric motor or steam turbine and has a fan mounted on the same shaft so as to provide a portion of the air for combustion under pressure to aid in the atomization of the oil as it leaves the edge of the rotating cup. Another type of rotary cup burner has the cup driven by an air turbine utilizing the velocity of low-pressure air from a centrifugal blower. This blower usually is located at a remote point from the burner and is of sufficient capacity to supply all of the burners in the battery, although there are some installations where each burner has its own individual blower. While the first cost of mechanical atomizing burners is usually comparatively high, the steam driven type has the advantage of returning all the exhaust steam for heating the boiler feed water. Further advantages of this type are simplicity and economical operation with uniform combustion regulation.

Burners for commercial installations are usually manually operated although they may have semi-automatic controls which vary the amount of air and oil as the load fluctuates.

For some burners, the air for combustion is partially supplied from a blower and is used to aid in the atomization of the fuel, the balance being induced by the natural draft through openings in the refractory hearth of the combustion chamber. These openings should be arranged to conform to the shape of the flame from the burner so that the air comes in contact with burning fuel and is not permitted to escape unused