carload deliveries should be provided for. Local ordinances and the requirements of the *National Board of Fire Underwriters* and the local bureau having jurisdiction should be studied and strictly adhered to, especially in the matter of locating and burying outdoor tanks and in the brick-housing and sand-fill usually required for large interior tanks that are not buried.

Where the storage tank is buried outside the building, the oil suction, oil return and the steam flow and return lines should all be run in one large split tile, carefully cemented. The steam line should then drop into the oil storage tank, either spirally around the suction line, thence returning through the tile, to discharge into the heating system trap, or the coil can extend to and be laid along the bottom of the tank, with the return similarly returning to the steam system. Great care should be exercised in the construction of steam lines inside of oil tanks, so that there will be absolutely no possibility of a leakage from the oil into the steam coils when coils are under a vacuum or of the steam leaking into the oil.

Every tank should be provided with a man-hole and with the following tappings:

4	in. fill	1½ in. return	1½ in. steam flow
3	in. suction	1½ in. vent	1½ in. steam return

All these tappings should be in the top of the tank. The suction pipe should not extend closer than six inches to the bottom of the tank. These tappings can be varied in size to suit local ordinances or conditions.

There are two general types of tanks—vertical steel and horizontal steel. Up to 10,000 gal. the horizontal steel tank is commonly used; the vertical steel tank is used for larger capacities.

Since the minimum car of oil is 8,000 gal., it is well not to plan any tankage of less than 10,000 gal. capacity, where carload deliveries are possible. Where oil companies maintain reserves of oil, smaller storage can be provided for than in districts where all the oil has to be brought in by car. In this case, there should be enough storage for a reasonable period. One ton of coal is equivalent to approximately 170 gal. of fuel oil.

Standard construction for underground horizontal steel tanks provides 3/16 in. steel for up to 4,000 gal., ¼ in. from 4,000 to 10,500, 5/16 in. from 10,500 to 20,000 gal. Vertical above ground tanks should be built in accordance with the Underwriter's tables for diameter and height.

While oil consumption can be fairly accurately checked by gaging the tank, the oil meter is the most logical method of quickly determining fuel costs and in estimating the relation between fuel consumption and work performed.

DOMESTIC OIL BURNERS

The problem of applying oil fuel to residential heating is essentially different from that pertaining to industrial installations. While in an industrial installation the size of the plant usually warrants the necessary investment for installing auxiliary equipment for preheating and atomizing the heavy fuel oils such investment is seldom warranted in the small plant required in a residence. Further, the hazard associated with preheating and the complication incident with atomization is an added

factor weighing against the use of heavy oils for this purpose. These facts results in the use of lighter or higher Baumè gravity oils for domestic purposes. These oils which include gas oil, distillate, and kerosene are liquids of low viscosity even at zero temperature.

Every manufacturer supplies complete information relative to the handling of the equipment, which should be mounted in the boiler-room.

The safety devices demanded by the Underwriters' Laboratories are varied, dependent upon the type of the equipment used, but the owner should familiarize himself with their purpose and care.

Noise may be divided into two kinds: (1) Purely mechanical and (2) noise of combustion. The former will depend upon the equipment used and its complication of mechanism. Combustion noise should be approximately the same in nearly all burners. Where the correct adjustment of air and oil is made to give the best efficiency, this combustion noise will be cut to a minimum. Any boiler that is heavily covered with insulating material will permit the transmission of less noise than an uncovered boiler.

The thermostatic equipment should consist of a room thermostat, centrally located in a position, representative of the general home temperature, remote from any source of heat or cold, and a boiler control to prevent the temperature of the water or the steam pressure from exceeding a predetermined point.

While oil burners are most successfully operating in hundreds of different makes and styles of boilers and furnaces yet in planning new heating systems the adaptability of boilers to oil burning should be given serious consideration. Generally speaking, boilers with a preponderance of indirect or flue surfaces, are best suited to oil burning, because an oil fire develops a considerably hotter flame than does coal. This means higher combustion gas temperatures, and naturally demands more heat absorbing, water-backed flue surfaces.

The problem of fuel consumption in residential heating plants is just as vital when an oil burner is used as with any other style of fuel. The factors that determine fuel consumption are:

Boiler efficiency
Heating plant efficiency
Temperatures carried
Normal heating demands
Abnormal heat losses
Burner adjustment.

It is not necessary to discuss these factors, with the exception of the last.

The proper adjustment of oil and air and the maintenance of that adjustment under varying draft conditions is important.

Fires misadjusted to a white color are obviously using an excess of air at the sacrifice of efficiency. The orange flame, with a minimum of excess air, constitutes what we term a "lazy, floating fire," which gives ample opportunity for the heat units to transfer themselves into the heating medium behind the walls of the boiler and its flues.

Where round domestic boilers are contemplated, those with a maximum number of horizontal water sections above the fire-box are to be preferred.