surface is excessive in amount. It is wise to use supply valves which will close tightly and to place lock-shield valves on the return ends of radiators, to facilitate repairs, and the lock-shield valves may prove invaluable in equalizing with great nicety the circulation.

In residence heating with hot-water it often suffices to install a general thermostat in some representative room, which controls the draft, as with coal, or which controls the fire, as with gas or oil, but there should always be furnished in addition a thermostat in the water or circulating medium which will reinforce the general thermostat and which will prevent boiling over in case the latter should be subjected to unfair exposure such as an open window.

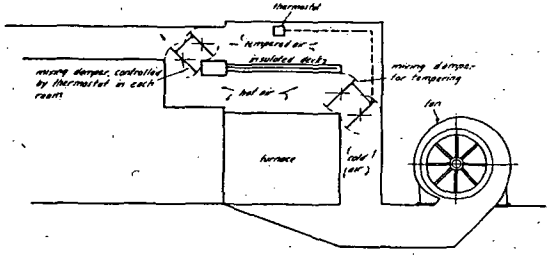


FIG. 64. AN ARRANGEMENT FOR TEMPERED AIR WITH WARM AIR FURNACES

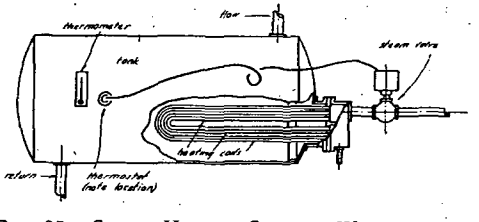


FIG. 65. STEAM HEATED SERVICE WATER HEATER

Warm-Air Heating

With warm-air heating from furnaces, with fans, as in public buildings, it is always necessary to provide a supply of tempered air for cooling after the rooms become warm. A duct thermostat and dampers easily and positively will accomplish this, either by mixing some cold air with heated air from the furnaces in an intermediate chamber, or by injecting some hot air from the furnaces into the cold air at the fan inlet, recirculating a measured and controlled part of the air around the furnaces. The room temperatures are controlled by intermediate thermostats and double mixing dampers the same as for a steam system.

Warm-air heating for residences may be controlled by a general thermostat in a representative room, and again, as with hot water, an additional thermostat at the furnace in the warm air chamber is desirable to reinforce the general thermostat.

Service Hot-Water Heating

It is safe to say that no service hot-water heater should ever be installed without automatic heat control. A unit type thermostat is most desirable, since it will function whether or not the general mechanical apparatus is in service, and will control steam and return valves or draft dampers, oil or gas fires, or electric heaters.

In hotels, hospitals and similar institutions, there should always be at least two independent water heaters, one having very hot water for

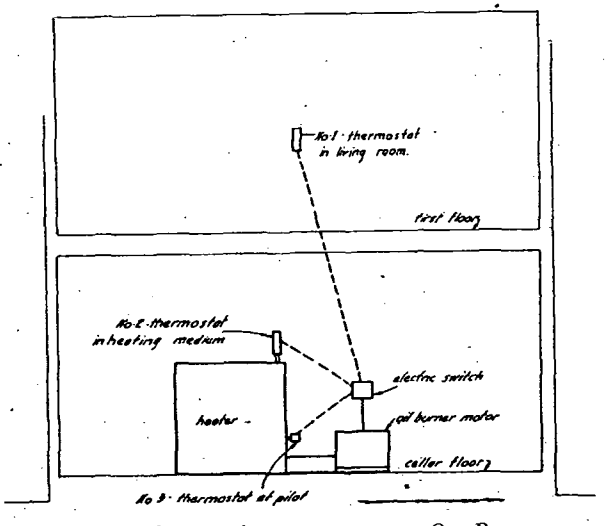


FIG. 66. TYPICAL ARRANGEMENT FOR OIL BURNER

kitchen uses, the other having water of medium temperature for bath and lavatory purposes, both controlled automatically. Thermostatic anti-scalding devices are available for showers and the like, but these will not prevent the great heat waste due to maintenance of scalding temperatures for bath water. No kitchen administration is satisfied without very hot water, but this demand is intermittent and small in volume as compared with usual bath and lavatory demands.

Oil Burner Control

No oil burning apparatus, unless provided with automatic heat control, can compete in operating cost with coal. An approved method for residence heating with oil is to install the following combination: