

always available gas is highly desirable, as it saves the trouble of operating a steam boiler.

Where steam is available it is probably more satisfactory than gas in that it can do no harm if a unit boils dry, whereas with gas under such a unit serious damage might ensue.

For ranges and ovens hard, liquid or gaseous fuels may be used. Electricity finds a wider use for cooking as each day passes.

#### Water Consumption

Hot water requirements for kitchens may be taken as 20 gal. per hour for each sink faucet and 40 gal. per hour per 1,000 pieces capacity per hour of dishwasher. There is a peak load which occurs at dishwashing time, and this may be met either by instantaneous heaters or by storage type heaters. The requirements of the dishwashing machine are somewhat under control of the operator, for by more liberal use of steam less hot water is used, and vice versa.

Cold water requirements are approximately double the hot water requirements.

#### Water Connections

Hot and cold water connections to sinks are  $\frac{3}{4}$  in.; hot water only is provided for dishwasher from  $\frac{1}{2}$  to  $1\frac{1}{4}$  in. according to size;  $\frac{1}{2}$  in. hot and cold water to "bain marie"; and  $\frac{1}{2}$  in. cold and hot water to coffee urns. Stock kettles, soup kettles, vegetable steamers, roasting steamers and potato peeler sinks are frequently provided with a  $\frac{1}{2}$  in. faucet over each of them, supported independent of the fixture. Generally hot water only is so connected. These are not an absolute necessity but often a great convenience. Drinking fountains and water coolers require  $\frac{1}{2}$  in. cold water connections.

In sizing mains to care for two or more items make the mains about one-half the sum of the areas of the branches.

#### Steam Consumption

The dishwashing machine will consume from 50 to 100 lb. of steam per 1,000 pieces capacity of machine, per hour. An allowance of 150 lb. steam per person per hour will meet all steam requirements for kitchens, except dishwashing machine and water heating.

The average steam requirements for a kitchen serving 300 to 500 persons will be cared for by a 25 to 30 hp. boiler. The annual consumption of such a kitchen will be about 2,000,000 lb. of steam.

#### Connections for Steam Supply

Steam connections to jacketed kettles, soup kettles, vegetable steamers, steam tables, coffee urns, plate warmers and roll warmers are  $\frac{1}{2}$  in. each, for smaller sizes and  $\frac{3}{4}$  in. each for larger sizes and in cases where runs are long. Steam connections to dishwashing machines are  $\frac{1}{2}$  to  $1\frac{1}{4}$  in. according to size.

In sizing mains to take care of two or more items make the area about one-half the sum of the branch areas, keeping the sizes well up toward the ends of the runs.

#### Return Connections

Return connections are uniformly  $\frac{1}{2}$  in. size and are made to all kitchen equipment having steam connections, except the spray to dishwashing machine. However, the coil in this machine requires a return connection.

Each unit or separate coil should be provided with a  $\frac{1}{2}$  in. thermostatic trap. If more than one unit or coil is connected to the same trap, air binding will result. Connections of the same size as for the traps are made to return mains.

#### Steam Pressure Limits

Not less than 30 lb. and not over 50 lb. are the usual pressure limits for steam cooking. Lower pressures down to 1 lb. are ample for warmers, but the steam kettles require higher pressures and it is customary to carry the higher pressures mentioned on all equipment. All jacketed pots have safety valves usually set at 50 lb. and usually vacuum breakers are required on the jacketed fixtures to prevent collapse under vacuum conditions.

#### Grease Traps

The dishwashing machine, all pot sinks, pan sinks and any sinks into which grease may find its way should be provided with grease traps. When grease traps on the individual fixtures are used the cold water supply to the fixture is connected to pass through the jacket of the grease trap.

#### Connections to Gas Appliances

Obtain from the manufacturer the gas consumption per hour of the different fixtures to be used and size the gas pipes accordingly. Excellent tables for this purpose, when the gas consumption and length of run are known, are given by the *American Gas Association*.

As an approximation the following connections commonly are found in equipment of average size: Bake shop oven,  $1\frac{1}{4}$  in.; pastry oven,  $\frac{3}{4}$  in.; dishwashing machines,  $\frac{3}{4}$  to  $1\frac{1}{2}$  in.; broilers, 1 to  $1\frac{1}{4}$  in.; ranges, 1 to 2 in.; small ranges in diet kitchens, 1 in.; salamanders and warmers,  $\frac{3}{4}$  in. and steam tables, 1 in.

#### Motor Sizes Required

Dishwashing machines require 1 to 2 hp. per 5,000 pieces capacity per hour to drive, with the smallest machine using  $\frac{1}{2}$  hp. motor. Kitchen mixing machines take  $\frac{1}{2}$  to 1 hp.; bake shop combinations, 2 hp. per barrel rating of machine. The 17 in. meat, food and vegetable choppers require 1 hp. and the 20-in. size requires 2 hp. Coffee grinders, knife polishers, silver burnishers need nominal amounts, about  $\frac{1}{4}$  hp. Vegetable peelers take  $\frac{1}{4}$  to 1 hp. according to size. Allow  $\frac{1}{2}$  hp. for a 25-qt. ice-cream freezer and 1 hp. for 40-qt. size.

#### Electricity Required for Cooking

In a complete electric kitchen, i.e., one in which ranges, broilers and hot-plates are electric, the minimum amount of electricity required for a complete meal is about as follows: