2. A *two-pipe* system is one in which all water returns to the heater after it has passed through one radiator. In a two-pipe system all radiators are supplied with water at the temperature at which the water leaves the heater, neglecting the cooling which takes place in the pipe leading from the heater to the radiator.

3. An *over-head* distribution system is one in which a main flow riser extends from the heater to the attic, the distributing main is located in the attic, and the return main in the basement.

4. An *under-foot* distribution system is one in which the main flow riser extends only to the basement ceiling, and the main flow line, as well as the main return line, is located below the basement ceiling.

5. A *direct-return* system is one in which the water, after it has passed through a radiator, is returned to the heater along a direct path, so that the total distance traveled by the water is the shortest feasible distance, and so that there are considerable differences in the lengths of the several circuits composing the system.

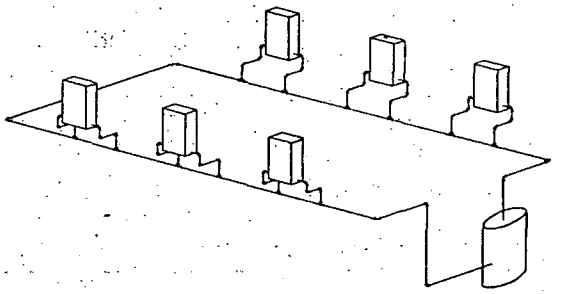

FIG. 4. ONE-PIPE GRAVITY FLOW HEATING SYSTEM

6. A *reversed-return* system is one in which the water from the several radiators is returned along paths arranged so that all circuits composing the system, or composing major sub-division of the system, are practically of equal length.

A reversed-return system is to be preferred to a direct-return system because it is easier to arrange the circuits so that, in every case, the friction head is equal to the pressure head, and because, in starting the system, all circuits of the reversed-return system begin to function practically at the same time, whereas, in a direct-return system, the longer circuits require considerably more time to begin operating than the shorter circuits.

Determining Pipe Sizes

Having settled on the arrangement of the circuits for the system, generally, for example, by selecting a scheme similar to one of those shown in Fig. 1, it is customary to assume the pipe sizes, and having done that, to calculate the pressure head and the friction head for every circuit. If the two heads happen to be practically equal, the assumed pipe size is the correct one. If there is a material difference between the two, a change is made in the assumed size of the pipe, or of a portion of the pipe, and a new friction head calculation is made. This process is repeated until the correct size has been found.

To illustrate the method, let it be assumed that the one-pipe system with under-foot distribution, as shown in Fig. 4, has been selected, and that the building to be heated requires six radiators, each one transmitting 9,000 B.t.u. per hour. In this case, the system may be assumed to consist of a major and six minor independent elementary heating

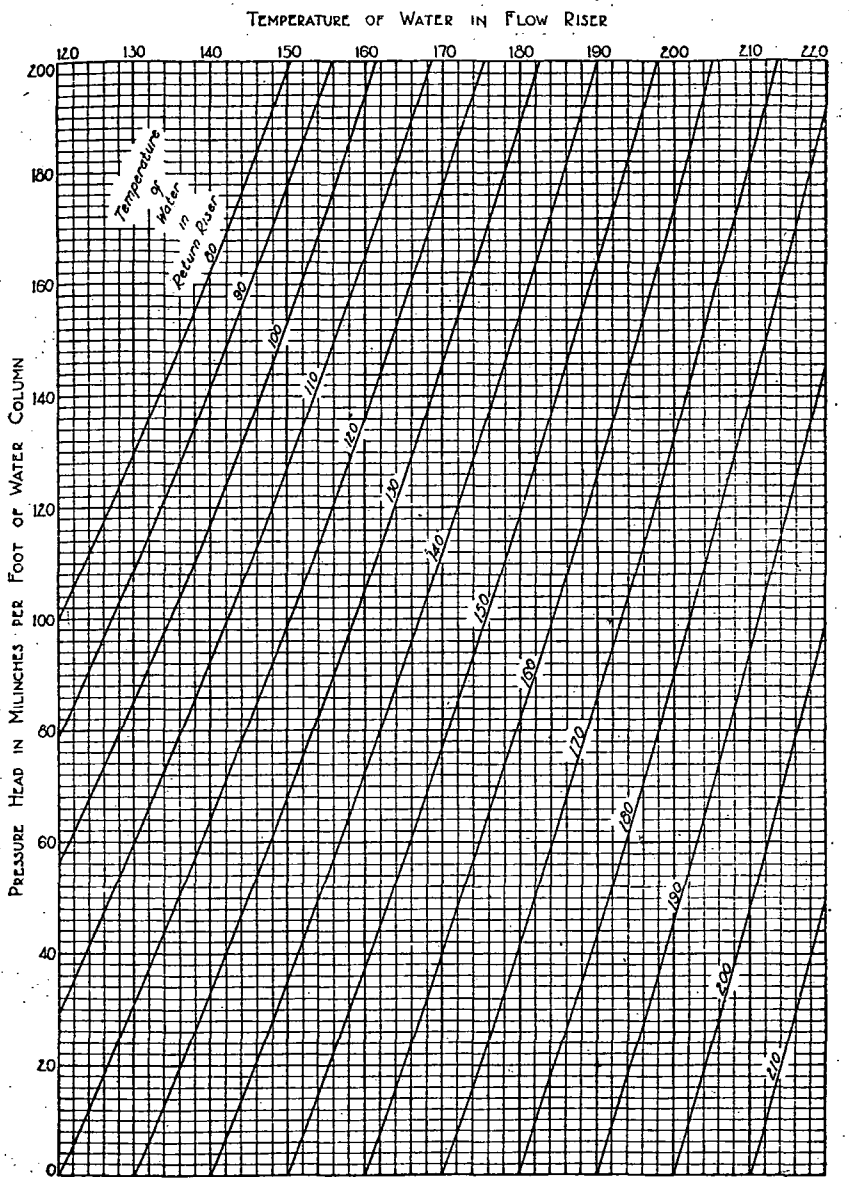

FIG. 5. PRESSURE HEADS FOR VARIOUS TEMPERATURE DIFFERENCES

systems. The major system consists of the heater and the flow main. The six minor systems consist each of one radiator with its flow and return lines connecting the radiator to the flow main.