TABLE 2. AREAS OF STANDARD SIZE PIPES OF STANDARD WEIGHT

| Nominal Size of Pipe Inches | Area of Pipe Sq. In. |
|---|---|
| ⅜ | 0.192 |
| ½ | 0.305 |
| ¾ | 0.533 |
| 1 | 0.863 |
| 1¼ | 1.496 |
| 1½ | 2.038 |
| 2 | 3.356 |
| 2½ | 4.784 |
| 3 | 7.388 |
| 3½ | 9.887 |
| 4 | 12.73 |
| 5 | 19.99 |
| 6 | 28.89 |
| 8 | 50.04 |
| 10 | 78.84 |
| 12 | 113.10 |

not usually the case to find much attention given to complicated formulae and curves; this is for the reason that the saving on installations involving only a few hundred dollars is so small as not to justify elaborate engineering calculation besides which the work itself is generally installed by a competition contractor and no funds are available for which a proper designer could be employed. As a general rule the contractor himself does all the designing which is necessary and he doesn't want to be bothered with any complication which can in any way be avoided.

Probably the simplest way of determining hot water pipe sizes in the ordinary small gravity system is the old method of taking the area of each radiator connection or valve and adding these areas together where the lines join, making the area of combined line practically equal to the sum of all the areas which the line supplies.

Thus if a pipe is feeding three radiators, one with a ¾-in. connection, one with a 1-in. connection and the third with a 1½-in. connection the sum of these areas is as follows:

| | |
|---|---|
| 1 in. | 0.863 sq. in. |
| 1½ in. | 2.038 |
| ¾ in. | 0.533 |
| | 3.434 sq. in. |

Referring back to the table it will be found that the pipe which has practically the same area is a 2-in. pipe which has an area of 3.356 sq. in.

For jobs of somewhat larger character where too much refinement is

TABLE 3. SQUARE FEET OF RADIATION ALLOWABLE ON RISERS UP TO 100 FT. HEIGHT

| Nominal Pipe Size Inches | Distance above the Boiler in Feet | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 | 100 |
| ¾ | 40 | 50 | 60 | 70 | 80 | 90 | 100 | 110 | 120 | 130 |
| 1 | 70 | 80 | 90 | 100 | 110 | 120 | 130 | 140 | 150 | 160 |
| 1¼ | 110 | 120 | 135 | 150 | 160 | 175 | 185 | 200 | 210 | 225 |
| 1½ | 180 | 185 | 210 | 230 | 250 | 265 | 285 | 300 | 315 | 330 |
| 2 | 300 | 350 | 400 | 500 | 575 | 625 | 700 | 775 | 825 | 900 |





unnecessary but at the same time closer results than that given in the above are desired, the table given below which takes into the consideration the height of the riser available to circulate the line may be recommended.

The risers are then connected up to the mains on the basis of allowing a factor for each size of pipe and then adding these factors to obtain the factor corresponding to the proper size of basement main. These factors are as follows:

TABLE 4. FACTORS FOR VARIOUS SIZES OF PIPE IN GRAVITY HOT WATER HEATING

| Nominal Size of Pipe Inches | Factor |
|---|---|
| ¾ | 5 |
| 1 | 10 |
| 1¼ | 20 |
| 1½ | 30 |
| 2 | 60 |
| 2½ | 110 |
| 3 | 175 |
| 3½ | 260 |
| 4 | 380 |
| 5 | 650 |
| 6 | 1050 |
| 8 | 2250 |
| 10 | ..... |
| 12 | ..... |

Thus, if the three radiators previously considered were set and sized as follows; the ¾-in. radiator with 20 sq. ft., and located 40 ft. above the boiler; the 1-in. radiator with 40 sq. ft. and set 20 ft. above the boiler and the 1½-in. radiator with 75 sq. ft., and set 10 ft. above the boiler all being on the same riser, the riser size would be as follows:

| | |
|---|---|
| Riser for 20 sq. ft. radiator 40 ft. above | ¾ in. |
| Riser for 40 sq. ft. radiator 20 ft. above | ¾ in. |
| Riser for 75 sq. ft. radiator 10 ft. above | 1¼ in. |

To combine into one riser take the factors and add;

| | |
|---|---|
| ¾ in. | 5 factor |
| ¾ in. | 5 |
| 1¼ in. | 20 |
| Total | 30 |

and the factor 30 is equivalent to a 1½-in. riser.

Even if these radiators had all been placed on the first floor, (or 10 ft. above the boiler), the riser size of 1½-in. would still have been sufficient for the three or their equivalent in one radiator. This indicates that the method of combiming valve areas gives about one pipe size larger than when more accurately figured.

## AIR SEALED OR CLOSED HOT WATER SYSTEMS*

For many years the closed system of hot water heating in some form has been used successfully abroad, but there has been little thought given to and no research work done in connection with the air sealed system in this country, so that available data is meagre. For design

*Prepared from data submitted by R. H. Feltwell, Philadelphia and H. A. Thrush, Peru, Ind.