TABLE 3. CHIMNEY SIZES FOR LOW-PRESSURE HEATING BOILERS AND WARM AIR FURNACES

| WARM AIR FURNACE CAPACITY IN LEADER PIPE SQ. IN. | STEAM BOILER CAPACITY SQ. FT. OF RADIATION | HOT WATER HEATER CAPACITY SQ. FT. OF RADIATION | NOMINAL DIMENSIONS OF FIRE CLAY LINING IN. | RECTANGULAR FLUE | | | ROUND FLUE | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | Actual Inside Dimensions of Fire Clay Lining In. | Actual Area Sq. In. | Effective Area Sq. In. | Inside Diameter of Lining In. | Actual Area Sq. In. | Height in Ft. from Grate |
| 790 | 590 | 973 | 8½x13 | 7x11½ | 81 | 70 | | | As height necessary is dependent upon the draft requirements of the varying designs, these factors should be known before height can be accurately determined. |
| 1000 | 690 | 1140 | | | | | 10 | 79 | |
| | 900 | 1490 | 13x13 | 11¼x11¼ | 127 | 99 | | | |
| | 900 | 1490 | 8½x18 | 6¾x16¼ | 110 | 100 | | | |
| | 1100 | 1820 | | | | | 12 | 113 | |
| | 1700 | 2800 | 13x18 | 11¼x16¼ | 183 | 156 | | | |
| | 1940 | 3200 | | | | | 15 | 177 | |
| | 2130 | 3520 | 18x18 | 15¾x15¾ | 248 | 195 | | | |
| | 2480 | 4090 | 20x20 | 17¼x17¼ | 298 | 234 | | | |
| | 3150 | 5200 | | | | | 18 | 254 | |
| | 4300 | 7100 | | | | | 20 | 314 | |
| | 4600 | 7590 | 20x24 | 17x21 | 357 | 278 | | | |
| | 5000 | 8250 | 24x24 | 21x21 | 441 | | | | |
| | 5570 | 9190 | | 24x24[a] | 576 | 380 | | | |
| | 5580 | 9200 | | | | | 22 | 380 | |
| | 6980 | 11500 | | | | | 24 | 452 | |
| | 7270 | 12000 | | 24x28[a] | 672 | 468 | | | |
| | 8700 | 14400 | | 28x28[a] | 784 | 531 | | | |
| | 9380 | 15500 | | | | | 27 | 573 | |
| | 10150 | 16750 | | 30x30[a] | 900 | 616 | | | |
| | 10470 | 17250 | | 28x32[a] | 896 | 635 | | | |
| | 11800 | 19500 | | | | | 30 | 707 | |
| | 14700 | 24300 | | | | | 33 | 855 | |
| | 17900 | 29500 | | | | | 36 | 1018 | |

[a]Dimensions are for unlined rectangular flues.

Chimneys recommended for larger boilers 15 to 250 hp. may be proportioned in accordance with the report made by a joint Committee of the *American Boiler Manufacturers Association* and *Stoker Manufacturers Association* and approved by these organizations. The sizes are given in Tables 4, 5 and 6. Chimneys for still greater horsepowers are given in Tables 5 and 6.

### *CHIMNEYS FOR OIL FUEL*[1]

The requirements for stacks for oil fuels are entirely different from those connected to coal-fired boilers, as there are certain losses through the boiler proper that are eliminated. Gas temperatures entering the stacks are lower for a given capacity, and the volume of gas is less than with coal. The cross-sectional area of the stack may therefore be less. In most instances this may safely be taken as 60 per cent of the area that would be furnished for coal-fired boilers. In determining the height, care must be taken to design a stack that will give a sufficient draft for the maximum requirements of the boiler, but no more. In this way the

[1]From Marks' Mechanical Engineers Handbook.





TABLE 4. DRAFT LOSSES WITH FORCED DRAFT STOKERS AND CORRESPONDING HEIGHT OF STACK FOR AVERAGE INSTALLATIONS (SEA LEVEL)[a]

| | RATING—PER CENT | | | | |
|---|---|---|---|---|---|
| | 100 | 150 | 200 | 250 | 300 |
| Furnace Draft[b] | 0.15 | 0.15 | 0.15 | 0.15 | 0.15 |
| Friction Loss (Boiler)[c] | 0.18 | 0.4 | 0.65 | 0.9 | 1.20 |
| Friction Loss (Breeching)[d] | 0.10 | 0.10 | 0.10 | 0.10 | 0.10 |
| Total Draft Required | 0.43 | 0.65 | 0.90 | 1.15 | 1.45 |
| Height of Stack (Ft.) | 80 | 112 | 145 | 178 | 220 |

[a]For boilers from 15 to 250 hp.

[b]Allow 0.15 in. for forced draft and 0.35 in. or higher, depending on rate of combustion and fuel used, for natural draft.

[c]Friction loss through boiler varies according to construction.

[d]Allow 0.05 in. for each right angle bend and 0.1 in. per 100 ft. of length.

TABLE 5. DIAMETER OF CHIMNEY IN INCHES FOR HORIZONTAL RETURN TUBULAR BOILERS[a]

| NOMINAL HORSEPOWER | RATING—PER CENT | | |
|---|---|---|---|
| | 100 | 150 | 200 |
| 15 | 13 | 14 | 17 |
| 20 | 14 | 16 | 18 |
| 25 | 16 | 18 | 20 |
| 30 | 17 | 19 | 21 |
| 35 | 18 | 20 | 22 |
| 40 | 19 | 21 | 23 |
| 50 | 20 | 23 | 25 |
| 60 | 21 | 24 | 27 |
| 75 | 23 | 26 | 29 |
| 90 | 25 | 28 | 31 |
| 100 | 26 | 29 | 33 |
| 115 | 27 | 31 | 34 |
| 125 | 28 | 32 | 35 |
| 150 | 30 | 34 | 38 |
| 175 | 32 | 36 | 40 |
| 200 | 33 | 38 | 43 |
| 210 | 34 | 38 | 44 |
| 225 | 35 | 40 | 45 |
| 250 | 36 | 41 | 47 |

[a]The figures in this table are based on the following assumptions:

| | | | |
|---|---|---|---|
| Rating | 100% | 150% | 200% |
| Efficiency | 65% | 65% | 63% |
| $CO_2$ | 8% | 9% | 10% |
| Stack Temp. deg. fahr. | 450 | 500 | 550 |
| Pounds of gas | 85 | 77 | 73 |

efficiency is safeguarded, and the danger of a draft such as to pull through too large an excess of air is eliminated.

Table 9, adapted from a similar table calculated by C. R. Weymouth (*Trans. A. S. M. E.*, Vol. 34, 1912) and based on actual test data, will be found to give satisfactory results under the assumed conditions as given for stacks with oil-burning boilers.