uncovered iron surfaces, exposed to air on one side and steam on the other, may be estimated as *two and six-tenths* heat units per square foot per hour per degree F. of difference of temperature between the steam and the air. If the air in the room be still, this amount may not be reached, but if exposed to violent winds it may be exceeded.

The heat passing up the chimney is not wholly lost, but is useful in producing a draft; and it can be shown that in a chimney where the draft is produced by the excess of weight of the outside air over that of the hot gas in the chimney, that the greatest quantity of gas by weight will pass up the chimney when the temperature of the gas in the chimney is about 625° F. hotter than the external air. With higher temperature the velocity of flow will be greater, and the quantity of gas by weight will be less, owing to its greatest volume. Looked at as a means of burning coal for making steam, the most coal that can be burned to advantage in a given time in a boiler furnace is when the temperature in the stack is near, but does not exceed, that of melting lead. A higher temperature than this means that the heat has not been properly taken out of the gas, and points to an increase in the boiler surface as a means of improving the performance of the boiler and increasing the yield of steam, as well as the economy of its production; a less temperature than the above is always desirable if the required quantity of steam can be maintained. In case twenty-four pounds of air per pound of fuel is used, the temperature of stack giving maximum quantity of coal burned, requires a little more than one-fourth of the heat generated to maintain the draft and the other three-quarters should pass into the water of the boiler. If we could get along with only twelve pounds of air per pound of fuel, only one-eighth of the heat generated would be required to maintain maximum draft. With forty-eight pounds of air per pound of fuel, one-half of the heat generated would be used in maintaining maximum draft. Here again the importance of hot fires is plainly indicated, and there is yet another reason for them: With a hot fire more of the heat generated passes into the water near the fire, leaving the products of combustion at a lower temperature to traverse the remainder of the surface and to leave the boiler at a lower temperature. More of the heat generated is therefore utilized than when the fire is not so hot.

A simple relation between the height of the stack in feet above the grate, its area in square feet, and the number of