

A CHAPTER ON COMBUSTION.

(From "Steam Making or Boiler Practice," by the late Prof. C. A. Smith, C.E., M.E.)

"THE process of combustion is well known to be due to the act of uniting carbon and hydrogen with oxygen ; other substances, such as sulphur and phosphorous, also develop heat when uniting with oxygen, but for our practical purposes carbon and hydrogen only need to be considered.

In fact, hydrogen is a very important element in fuel, although forming but a very small part by weight of ordinary coal, the fuel most in use as a combustible.

The first question which arises is, how much air must be supplied to our fuel in order to produce complete combustion, the air being required for the oxygen therein contained.

The quantity of air required varies with the composition of the fuel, but if we say that for each pound of fuel we must supply twelve pounds of air, we shall be sufficiently near the truth. The volume of air will, of course, depend upon its temperature.

Now, the quantity of heat which can be developed by the combustion of one pound of pure carbon, is sufficient to boil fifteen pounds of water from and at a temperature of 212° Fahrenheit if none of the heat was lost ; but there are many reasons why we do not reach this result in practice, and they are as follows :

FIRST. — Variations in the quality of the coal as to its chemical constitution, affecting thereby its calorific power.

SECOND. — Impurities found with and mixed in the coal, affecting the actual quantity of pure coal in any given amount.

THIRD. — Imperfect or incomplete combustion of the fuel.

FOURTH. — Losses of heat from the furnace, the fire, and the metal of the boiler.

FIFTH. — The heat carried off in the stack, more or less utilized in the creation of draft.

1. *Variations in the quality of fuel.* — From the results of chemical analysis, the evaporative power of various kinds of fuel, expressed in pound of water per pound of fuel evaporated