THE SMOKE NUISANCE

BY KARL J. ZELLNER

MANY cities are taking active steps to investigate the cause and the methods to be used for the abatement and in due time the elimination of the smoke nuisance. The federal government is conducting scientific investigation through the bureau of mines; while in the cities ordinances have been passed; commissions have been appointed to investigate and smoke inspectors placed in charge of smoke abatement departments. Campaigns are being conducted, the main object in view being to educate the people to the fact that the smoke nuisance, while being to a great extent an engineering problem, is their problem as well, and one in which the public should be interested from a financial and an economic point of view.

It is possible from an engineering standpoint absolutely to prevent objectionable, dense smoke; yet without an intense, widespread public sentiment, based on an intelligent knowledge of the effects of smoke, efforts in this direction will be of little avail. Public opinion must be formed, and the community operate to this end. Some city ordinances—for example, that of Baltimore—prohibit the emission of dense black or gray smoke for a longer period than six minutes in any one hour. Cincinnati has the same provision. The Pittsburgh ordinance provides against the emission of dense black or dense gray smoke except for eight minutes in any one hour. The Cleveland ordinance allows no period at all for the emission of dense black smoke.

For any smoke inspector to determine the density of smoke emitting from a stack, the standard method recommended by the American society of mechanical engineers is used. This standard is based on the Ringel-man smoke scale. These charts are simply squares in each of which is included 100 sub-blocks, the lines dividing the squares into sub-blocks being of varying shades of blackness. In making an observation to determine the density of smoke the four charts are placed between the observer and the smoke, and the color of the smoke as it emits from the stack is matched with the degree of density of the blackness on one of the cards. At a distance from thirty to fifty feet from the observer these colors on the cards blend into varying shades of gray. The smoke ordinance usually specifies the chart to be used as the standard.

The more dense the smoke the greater the waste of fuel in the furnace, for black smoke, while thought by some to be the only feature of the nuisance, is relatively the least harmful part. Smoke is the visible sign

of imperfect combustion; the useful signal of something wrong in the combustion process; smokeless and complete combustion are practically synonymous terms, that is, the former cannot exist in the absence of the latter.

For perfect combustion there are three primary requisites, namely, carbon, oxygen, and the maintenance of sufficiently high temperature to make possible complete, chemical combustion of the first two factors. Perfect combustion means a great saving in fuel to the plant owner; imperfect combustion means a loss of a large part of the volatile fuel of high heating value. At the same time imperfect combustion also causes a great loss to the nation, the community and every individual.

The deleterious gases in smoke are principally carbon monoxide (CO) and sulphur dioxide (SO₂), the latter combining with the moisture in the air and in time forming sulphuric acid. Statistics show that there are more people subject to bronchial and nasal troubles in a smoky city than in a clean one, and that pneumonia and typhoid fever are more fatal in a smoky atmosphere. These gases not only pollute the air we breathe, but are destructive to vegetation, cause the deterioration of buildings, ruin draperies and cause a negative loss to cities by keeping out those industries which require a clean atmosphere for the manufacture of their products. It is claimed that the smoke nuisance costs the country \$600,000,000 a year; and that the damage done by smoke in the large towns of the United States would build in every city over 100,000, a structure equal to the Congressional library, maintain the army and navy for a year and build the capitol at Washington.

Yet how can this nuisance be remedied? Electrification is conceded to be the solution for the railway smoke. It has a most promising future, though the results will be gradual, but sure to come in time. Central power and heating plants using automatic stokers and carefully designed and operated furnaces, are fast coming to the front as a remedy. The gas producer has been proved one of the most efficient remedies. The power, developed at the mine in the form of electricity or gas, can be carried by means of cables and pipe lines. It is an interesting fact that one ton of coal in a gas producer will produce two and one-half times as much power as that developed by the same amount of coal in a steam plant.

Along with these remedies is suitable legislation supported by public opinion. All smoke ordinances should contain a provision that all plans for new boiler plants, or proposed reconstruction of old ones, must be approved by the chief smoke inspector, before work of erection or improvement is started.