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MIXING GASEOUS FUELS

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1 Claim. (Cl. 48—180)

This invention relates to the mixing of gaseous fuels, and is particularly concerned with the use of coke-oven gas as a fuel for open-hearth furnaces and other heating equipment.

As is well known, coke-oven gas is not only used as a fuel for open-hearth furnaces but is used for other purposes as well. Furthermore, coke-ovens are not always operated on a sufficiently large scale to provide an adequate volume of fuel for the open-hearths. As a result of these and other conditions, it is frequently desirable or necessary to mix some other gaseous fuel with the coke-oven gas for the purpose of maintaining an adequate supply of gaseous fuel at a constant pressure.

It is necessary to maintain the supply at a constant pressure for the reason that open-hearth furnaces are usually controlled by apparatus which function by varying the fuel flows through the medium of valves. It follows that accurate operation depends upon the B. t. u. per cubic foot value and specific gravity of the fuel, the setting of the valves being quite generally used as an indication of heat input.

Therefore, the mixing of the other gaseous fuel with the coke-oven gas is not practical unless the operators of the open-hearths are notified of the change and of the extent of this change, since they would not otherwise know how much heat was actually being put into the furnaces. However, this does not provide an adequate remedy for the reason that it is not always possible to so notify the operators and also because the operators cannot always calculate the necessary changes in the settings of the valves with sufficient rapidity and accuracy.

The object of the present invention is to provide for the mixing of some other gaseous fuel with coke-oven gas so as to maintain a supply of gaseous fuel at a constant pressure and which is of such a character that it is not necessary to make any changes at the open-hearths, either when the fuel is mixed with the coke-oven gas or when the relative proportions of the two are changed.

The above is accomplished by mixing a tertiary gas with the gaseous fuel added to the coke-oven gas, this tertiary gas being of such B. t. u. per cubic foot value and specific gravity and used in such proportions as will produce a gaseous mixture having its B. t. u. per cubic foot value so related to its specific gravity as to provide the same B. t. u. per cubic foot when passed through an orifice under a constant pressure and burnt, as does coke-oven gas when burnt alone under similar conditions. When this is done, it is possible to mix this gaseous mixture with the coke-oven gas in any proportions without causing any difficulty at the furnaces.

Because of its availability and cheapness, natural gas is a good example of the gaseous fuel to be mixed with the coke-oven gas. The latter gas provides 500 B. t. u. per cubic foot when burnt under proper conditions, while the former provides 1000 B. t. u. per cubic foot when burnt. In addition, natural gas has a specific gravity of about .66 while coke-oven gas has a specific gravity of about .35.

Assuming that the valves of apparatus controlling a furnace have been calibrated to handle coke-oven gas alone, it is apparent that the mixing of the natural gas with the coke-oven gas will materially upset accuracy at the furnace. This follows from the fact that the variation in heating value and specific gravity resulting from the mixing will naturally result in a greater input of heat to the furnace.

It is to be understood that although natural gas has a higher specific gravity than has coke-oven gas, that this decrease in its ability to pass an orifice is not compensated by its increased heating value, the latter greatly overbalancing the former. The resulting increase in heating value may be easily determined by the application of Grahams' Law, the heating values of the gases being known.

As a specific example of the invention, this problem of mixing natural gas with coke-oven gas so as to maintain a supply of gaseous fuel at constant pressure for open-hearths controlled by apparatus which function by varying the fuel flow, will be solved.

This is done by first mixing air with the natural gas so as to produce a gaseous mixture of 72.5 per cent natural gas and 27.5 per cent air. Although this mixture will not necessarily have the same B. t. u. per cubic foot heating value and the same specific gravity as does coke-oven gas, these factors are so related that when the mixture is passed through an orifice of fixed size and burnt, the same B. t. u. output will result as when coke-oven gas is burnt under similar conditions.

This mixture is then mixed with the coke-oven gas as and when desired or required. Although different volumes of fuel may actually be passing through the valves controlling the furnaces, the actual heat input to these furnaces will be the same as when coke-oven gas alone is used. Consequently, the setting of these valves remains

an accurate indication of the heat being put into these furnaces.

It follows from the above that a gaseous mixture consisting of 72.5 per cent natural gas and 27.5 per cent air is of itself valuable in that it may be mixed with coke-oven gas in any proportion and yet not interfere with furnace operations.

I claim:

A method of mixing natural gas of approximately 1000 B. t. u. per cubic foot heating value with coke-oven gas of approximately 500 B. t. u. per cubic foot heating value so as to maintain a supply of gaseous fuel at constant pressure for heating equipment controlled by apparatus which functions by varying the fuel flow, said method including mixing air with said natural gas so as to produce a gaseous mixture of 72.5 per cent natural gas and 27.5 per cent air, and mixing said gaseous mixture with said coke-oven gas so as to maintain said supply.

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