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The president of the society this year is Geo. F. Swain, Professor of Civil Engineering, Harvard University.

PULVERIZED COAL.

The use of coal that has been pulverized as a fuel, and the economic value of same, is interestingly described in a paper by Mr. H. R. Barnhurst, published in a recent issue of Metallurgical and Chemical Engineering. He states that the requirements necessary to success, while simple, are absolute and must be obeyed.

First—The coal must be dried so that it contains not over 1 per cent. of moisture.

Second—The coal must be pulverized to a high degree of fineness.

Third—It must be projected into a chamber hot enough to cause instant deflagration.

Fourth—It must be supplied with air sufficient to yield the oxygen necessary to burn the carbon of the coal at once to CO_2.

Taking up these requirements in order, the drying of the coal to a moisture content of not over 1 per cent. is indispensable. Coal does not grind well if moisture in excess of this be present.

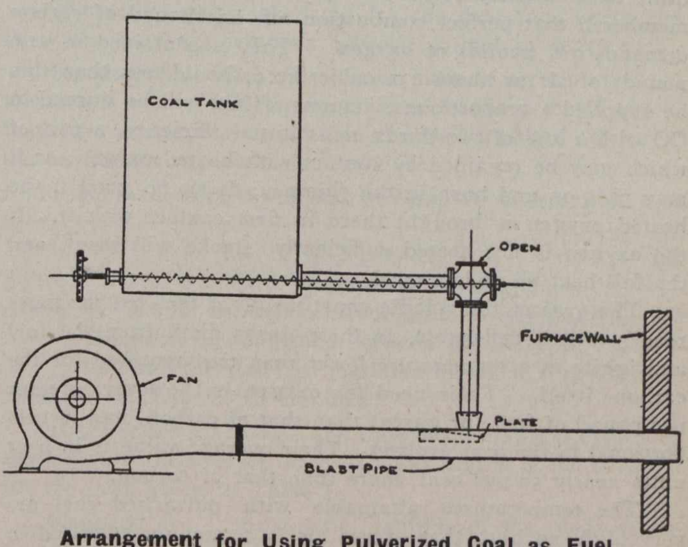
In burning coal the moisture, free or combined, must be disposed of either in the process of preparation or in the moment of combustion. In the latter case not only is the efficiency of the furnace lowered by the calorific investment in the superheated steam passing out as a product, but the temperature of the furnace is lowered materially. The drying of wet coal in the furnace itself, is doing this necessary part of the work in the most expensive place and at the cost of temperatures which may be essential to the industrial process of which high heat is a factor.

Fine grinding—With the best type of machines obtainable for this purpose, the coal and its contained impurities may readily be powdered to such a degree that under the screen tests 85 to 90 per cent. will pass through apertures 1/400 in. square, while the total residuum left upon a screen whose apertures are 1/200 in. square, will be from 2½ to 5 per cent. and this residuum would pass through screens of 1/100 in. square. It must, however, be borne in mind that of the percentage passing the smaller apertures 1/400 in. square there is a high percentage of absolute dust or impalpable powder not commercially measurable. This is proven by the fact that in tests made upon calibrated screens of 1/600 in. square apertures, over 70 per cent. still passed through. It certainly appears to be safe to assume, therefore, that the average size of the particles would be below a cube measuring 1/600 in. on the side.

It may be interesting, therefore, to state that the total numbers of particles resulting from the powdering of 1 cubic inch of coal to the dimensions given would yield 216,000,000 grains of dust. Simple calculation on this basis shows that while a cubic inch of coal exposes 6 square inches for the absorption and liberation of heat, the surface exposed for the same purposes by the powdered coal is 25 square feet. Inasmuch as no fuel burns until it is heated to a temperature at which it developes more heat than it receives, the advantage of this enormous absorbing and delivering surface is apparent. The result of this is shown in the clearness and uniformity of the flame produced. Where coarse particles are permitted to enter the furnace, the distinct sparkles are apparent. These larger particles are carried beyond the region of oxygen supply and are for this reason not fully burned.

Third—While coal ignites freely, in a hot chamber, this ignition means the absorption of heat from somewhere, and if the coal rapidly projected by air does not develop its heat near the point of ignition, means must be devised to maintain the heat necessary for ignition where it is needed, i.e., at the first entrance of the coal into the furnace. It is apparent, therefore, that giving the fuel too great velocity upon entrance is not good practice.

Considering the fourth requirement along with the third we would say that some singular errors and misconceptions have attended the practices of many users of powdered coal. More particularly do we refer to the use of large fans to supply the air necessary for the projection of the fuel, where the air nozzle has been reduced from 16 in. or 18 in. diameter to 4 or 5 in. at the jet under the expectation that all of the air in the 16-in. or 18-in. pipe would be hurried through the 4 or 5-in. nozzle if not a smaller one. The futility of this is apparent.



Arrangement for Using Pulverized Coal as Fuel.

To describe the operation more clearly, the coal is received in a bin over the feeders. (Fig. 1). Its weight is about 38 lb. per cubic foot when loose in the bin. Settling awhile brings the weight to about 45 lb. per cubic foot by displacing the entrained air. Across the bottom of this bin and within a pipe extending horizontally from it is a double-flight worm or feed screw. This double-flight screw resists the tendency of the light coal to flow of itself along the feed pipe. This screw extends over a flanged pipe-cross into which the fuel is delivered. The rear end of the screw is supported by a bearing in a flange on the side of the bin near the bottom, the shaft projecting to receive a driving pulley or chain sprocket. The delivery end of the screw shaft is supported by a bearing in the cover of the horizontal opening of the flanged pipe-cross. The top opening of the cross is uncovered to permit the air to draw down with the falling fuel. This fuel dispersed in the air so drawn in, de-