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## Some Possibilities in Fuel Economy

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In a recent number of *Revue Générale des Sciences*, Camille Matignon of the College of France presents an exhaustive review of the measures taken by Germany to supply the immense quantities of combined nitrogen demanded by her agricultural and munitions industries—a task made all the more difficult by the cutting off of Chilean importations by the Allied blockade.

Of the more important synthetic processes, the fixation of atmospheric nitrogen with calcium carbide to form cyanamide and the hydrolysis of the latter to ammonia, and the Maber process involving the direct combination of the elements hydrogen and nitrogen, have assumed the places of chief importance; the synthesis of nitric acid from the elements of air, because of the country's lack of water power for producing electrical energy, has taken a minor position.

But of the greatest interest, indicating as they do a program of conservation that may well be adopted here, are the economies practiced in coal consumption with a view to reclaiming the nitrogen of the fuel as ammonium salt. A great industry like that of by-product coking whose output is a number of products differing widely in character and having fundamentally different applications, such as coke and gas on the one hand and ammonia and tar distillates on the other, depends for its growth and success upon the proper adjustment of markets for their commodities. Naturally in a war crisis the demand for the product of the second type as raw material for explosives outstrips that for the other, and the accumulation of the less valuable coke tends to act as a drag on ammonia production.

According to the author quoted, however, the situation has been met and solved by a campaign for the substitution of coke for coal as fuel in the railroad and manufacturing industries and even in domestic heating—a reform which has made little progress in this country perhaps because of the failure of furnaces designed for the use of coal to adapt themselves to a substance of widely different character. Moreover, the by-product gas producer of the Mend type furnishes its quota of war material and, in addition, a cheap gas for use in power production. A typical plant at Lettengraben with ten producers gasifies six-hundred tons of coal per day, furnishing electrical energy at a price of less than one-half cent per kilowatt-hour.

The moral is near at hand. Neither Professor Matignon nor the author of this paper feel called upon to extol German industrial genius, not be-

cause it is not in many respects admirable, but because German "kultur" has ever been a poppy in the sun rather than a violet in the wood. But the situation throws into sharp contrast some of the features of the fuel industry in the United States, such a one as, for instance, is brought to the traveler's attention in a night's ride on the Baltimore & Ohio through the Connellsville region in Pennsylvania, where the thousands of bee-hive ovens twinkle along the horizon, but where every twinkle spells waste. Or such a one as the citizens of Pittsburgh or of Chicago or of a thousand and one other cities considers with melancholy patience as a myriad of stacks and chimneys pour out their pollutions on the winter air.

The problem of fuel conservation is not a simple one. Economic conditions shape and govern the fuel markets as they do those of any other commodity. But economic conditions are changing, and it seems inconceivable that present methods of converting the latent energy of coal into the kinetic form can long withstand the pressure of engineering progress. Certain it is at any rate that the chemical engineer trained in the fundamentals of mechanics to enable him to appreciate the difficulties of the operating engineer and even sympathize with his prejudices, and in the principles of chemistry with special reference to its physical aspects, may find in the field of fuel engineering a man's work to be done.

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