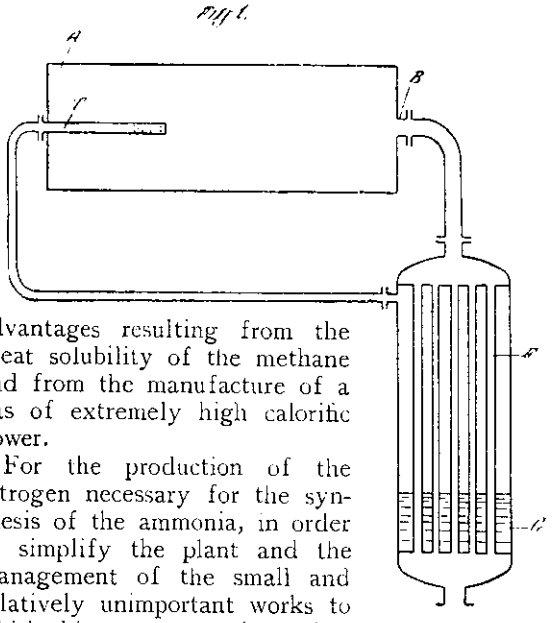
This operation, by being repeated successively in the different furnaces composing the plant, may thus be arranged to supply a constant addition of water gas to the production of normal gas. This supplementary water gas could also be produced, as has already been proposed, by sending the red coke on being withdrawn from the furnace into extinguishers, where it is quenched by jets of steam. In accordance with the new process the supplementary water gas produced by the preceding means may be added to the gas normally produced and the hydrogen may be extracted from the whole of the gases obtained or else it may be reserved, either alone or mixed with methane, for heating the furnaces, the production of motive power, etc., the rich gas being reserved for the extraction of the hydrogen, so as to benefit from the



advantages resulting from the great solubility of the methane and from the manufacture of a gas of extremely high calorific power.

For the production of the nitrogen necessary for the synthesis of the ammonia, in order to simplify the plant and the management of the small and relatively unimportant works to which this new process is particularly applicable, there may be burnt in gas engines with air about one-seventh of the hydrogen available which will thus yield, at the same time as the nitrogen, a part of the motive force required in the plant.

By the extraction of the hydrogen from the gas of the coal carbonising furnaces which is rendered easy by use of the dissolving processes hereinbefore referred to and which is still more facilitated by the production, in a kind of gratuitous manner, of a large quantity of supplementary water gas, and further owing to the use of a process for the synthesis of ammonia which permits of the employment of units of as low a degree of output as desired, the synthetic ammonia may be regarded as a by-product of the manufacture of coke, and especially of metallurgical coke, as the production of coke of any given works is only diminished thereby by 4 or 5 per cent. A battery of furnaces producing 300 tons of coke per day, for example, produces a rough total of 100,000 cubic metres of gas containing 50,000 cubic metres of hydrogen from which, even if not counting upon the hydrogen from the supplementary water gas, it is easy to extract 40,000 cubic metres of hydrogen, permitting practically of the manufacture of 15 tons of ammonia, NH_3, the market value of which is close upon that of the 300 tons of coke.

If it be remarked, on the other hand, that the utilisation of synthetic ammonia, save and excepting unexpected developments, entails of necessity the manufacture as a by-product of carbonate of soda (see for example British Patent No. 130365) it is possible to see what important consequences of an individual character are bound to result from this inevitable conjunction in the future of three of the greatest modern industries, namely, metallurgy and the industries devoted to the production of nitrogen and soda.

The features of novelty comprised in this new process of L'Air Liquide are as follows :—

1. The method of obtaining hydrogen and nitrogen for the synthetic production of ammonia by the hyper-pressure process consisting in separating hydrogen by a solution method from the gases given off in the distillation of coal in a coal gas or coke producing plant, utilising a part of the hydrogen for the manufacture of the ammonia and utilising another part of the hydrogen as fuel in a gas engine whereby nitrogen is obtained for the manufacture of the ammonia.

2. The method of obtaining hydrogen and nitrogen for the synthetic production of ammonia as set out in (1) above and of increasing the quantity of available gas from the coal carbonisation plant by the addition of water gas obtained by passing steam over hot coke which remains after the distillation of the coal.

3. The combination with a coal distillation plant of plant for the synthetic production of ammonia by the hyper-pressure process comprising means for separating hydrogen by a solution method from the gases given off in the distillation of the coal, part of said hydrogen being employed in a gas engine to remove oxygen from air, the remaining nitrogen being employed for the production of the ammonia.

4. The combination with a coal distillation plant, of plant for the synthetic production of ammonia by the hyper-pressure process comprising means for obtaining water gas by injecting super-heated steam on to the hot coke of the coal distillation retorts generating and super-heating the steam by means of the heat of the gas evolved from the retort mixing the water gas produced or part of it with the gaseous products of distillation of the coal and means for separating hydrogen by a solution method from the mixture of gases, part of the hydrogen being employed with air in a gas engine so obtaining the necessary nitrogen for combining with the hydrogen to form ammonia.

5. The combination with a coal distillation plant of means for obtaining hydrogen and nitrogen and for the synthetic production of ammonia by the