land, and a few of the plants are still to be seen at work in the latter country.

Messrs. Koerting Bros., Koertingdorf, Germany, were conducting experimental work along this line, and in 1895 they took out patent rights for a producer plant in which the air and steam were drawn through the plant under the influence of the negative pressure caused by the piston of the gas engine during charging or suction strokes. The results obtained from experiments with

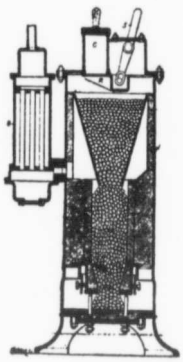

Fig. 3—The Taylor Producer.

this plant were discouraging, and the patents were abandoned. Irregular working of the engine under light load was experienced, due to the fluctuating low pressures through the plant; and it was concluded that the pressure type of producer was the most effective.

The Early Pintsch Producer.

Thus the development of the suction producer plant with the regenerative steam boiler received quite a set-back. But in 1901 Julius Pintsch, Germany, designed and erected a suction producer plant to supply gas for an engine driving electrical machinery at Verviers, in Belgium. In spite of the many predictions to the contrary, the plant was a splendid success, and the installation has been in successful operation ever since. This plant is shown in Fig. 4 and, with the exception of a few details, is the same as the plant now made by the Julius Pintsch, in Germany, and by other firms having manufacturing rights.

In the diagram of the plant, (A) is the producer; (B) is the steam boiler, the steam being generated by the hot gases passing through it; (C) is a safety box which is left out on modern plants as unnecessary; (D) is a syphon; (E) are overflows; (F) is a wet scrubber filled with wooden grids; (G) is a sawdust purifier; and (H) is the governor.

Since that date there has been a marvelous development in the producer gas plant industry, and especially in the line of suction producers. Just eight years ago there was not a successful suction producer on the market, while now hundreds of firms in different parts of the world can supply producers of any size required.

TWO MAIN TYPES OF PRODUCERS, PRESSURE AND SUCTION

There are two distinct types of producer gas plants, the pressure and the suction. The pressure plant is one in which the air and steam blast is forced through the producer, either by steam pressure, as in the Dowson plant, or with a fan, as in the modern types of producer. A gas holder is essential in a pressure plant.

The suction plant is one in which the mixture of air and steam is drawn through the producer by the suction action of the gas engine, and no gas holder is required. There is another style of plant in which the air and steam blast is drawn through the producer by the action of a suction fan, which discharges into a holder. The fan is placed in between the scrubbing and drying apparatus and the gas holder, so that there is a negative pressure in the plant proper. This type of plant is strictly speaking neither a pressure nor a suction plant; but because of the gas being under pressure in the holder, it is commonly thought of as a pressure plant.

At first suction plants were made only in small sizes, i.e., 65 h.p. or less; pressure plants were installed when greater capacities were required. But now makers have full confidence in the suction plant for the larger horse powers, and suction plants are now commonly made in sizes up to 200 h.p. For larger horsepowers than this it is general practice to adopt the pressure plant.

It also has been common practice to use a pressure plant where more than one engine is to be operated from the same producer. But some firms now have devised regulating devices for the suction plant whereby more than one engine can be efficiently operated from the same plant.

When the gas is to be used for anything but power purposes a pressure plant installation is of course necessary.

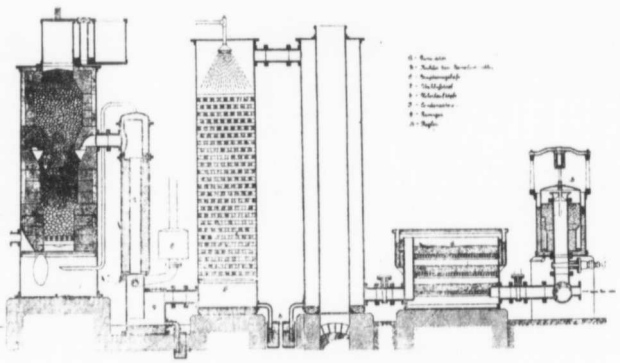

Fig. 4—The Earliest Pintsch Producer.

THE PRESSURE PLANT

The pressure gas plant is, as we have seen, the original plant; and the pressure plants now being made have been modelled after the original Dowson plant. Many improvements, however, have been made to minimize the complication, and to increase the efficiency of the pressure plant.

For instance, the separate boiler, which was responsible for such a large percent of the fuel consumption, is no longer used, except in special cases. Instead a vaporizer is provided in which the water is vaporized by the heat from the gas as it comes from the producer; then too the air and steam blast is supplied by a pressure fan in the modern plants, instead of by the steam pressure as in the Dowson plant. In some plants the steam is vaporized and is mixed with the air blast, while in others the air blast is passed over the surface of vaporizing water, and the blast thus becomes saturated with steam.

Only anthracite coal could be used with the original Dowson plant, and this was one of its objectionable features, especially in England where there is so much bituminous coal, and not much anthracite. This fact led to considerable experimenting in the use of bituminous coals, both in England and on the continent. The chief difficulty met with, of course, was in the purifying of the gas. It is claimed that Dr. Mond was the first to originate a successful bituminous coal plant, not many years since. This first plant was installed in England at the works of Brunner, Mond & Co., and it is still in operation.* In this style of plant the ammonia given off in the production of the gas is recovered, and the plants are spoken of as ammonia recovery plants of the Mond type. But these plants cannot be operated economically in units of less than 3,000 h.p., although there is an adoption on the market for moderate powers, but this is rather cumbersome and expensive.* In the adoption referred to, no attempt is made to recover the ammonia, and it was claimed that the heavy hydrocarbons in the gas were fixed by means of a common storage bell in the producer; but subsequent practice shows this to be inaccurate, and special provision is required to effectively get rid of the tar in the cleaning of the gas.

Methods of Getting Rid of Tar.

"There have been a great many processes originated for treating the tars in bituminous coals during the last few years, and they invariably aim at fixing or destroying the tars given off by such coal. They have not so far been successful, at any rate, not to such a degree that cleanliness of the gas has been the result, and it has invariably been proved that the capital cost of the extra apparatus required to enable the tar to be so treated has far exceeded the cost of an ordinary plant,

* Thomas Rigby, in paper on "Power Gas Plants" presented to the Manchester Association of Engineers in 1905.