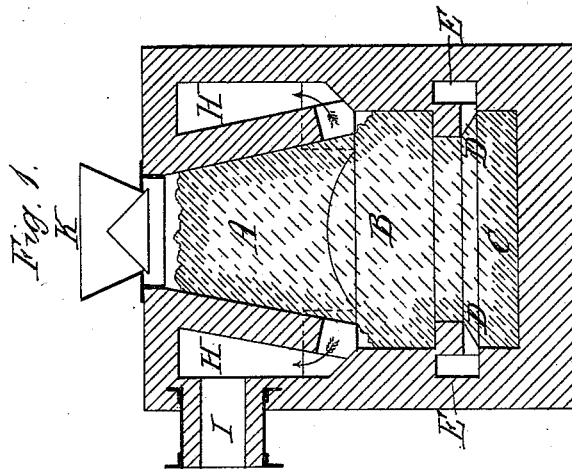
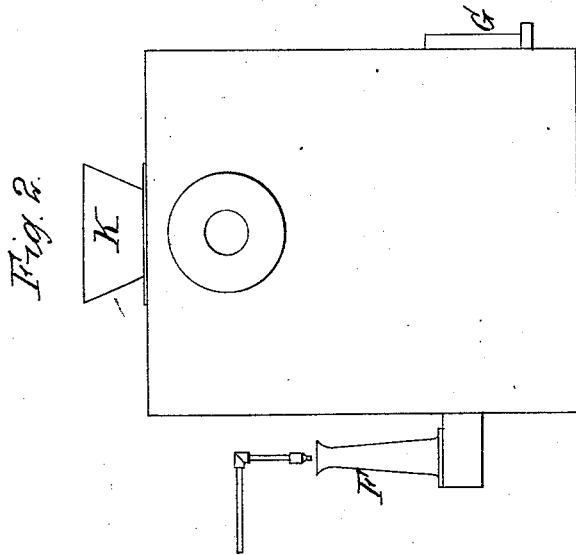


E. BROOK & A. WILSON.  
Gas-Generating Furnace.

No. 213,318.

Patented Mar. 18, 1879.



Witnesses

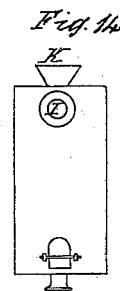
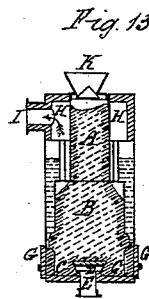
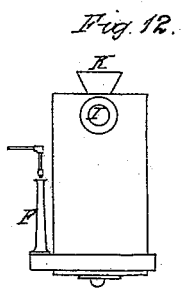
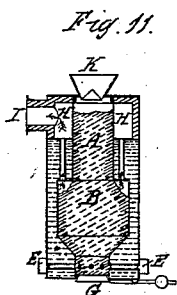
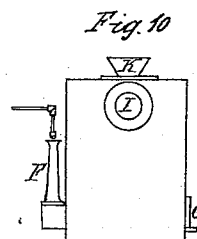
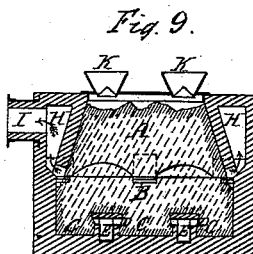
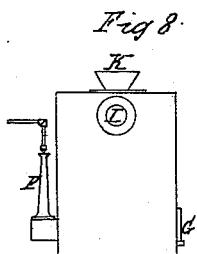
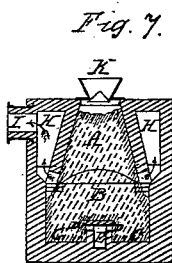
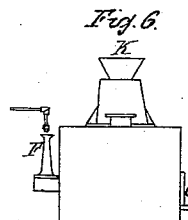
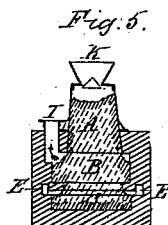
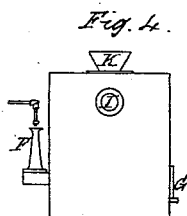
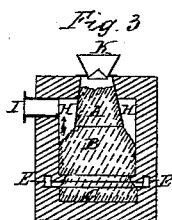
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# UNITED STATES PATENT OFFICE.

EDWARD BROOK AND ALFRED WILSON, OF MIDDLESBOROUGH-ON-TEES,  
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## IMPROVEMENT IN GAS-GENERATING FURNACES.

Specification forming part of Letters Patent No. **213,318**, dated March 18, 1879; application filed December 21, 1877; patented in England, October 12, 1876.

*To all whom it may concern:*

Be it known that we, EDWARD BROOK, engineer, and ALFRED WILSON, engineer, both of Middlesborough-on-Tees, in the county of York, Kingdom of Great Britain and Ireland, have invented certain new and useful Improvements in Gas-Producers, which improvements are fully set forth in the annexed specification.

This invention relates to gas-generators; and it consists in the combination of a retort in which the gas is generated, a combustion-chamber in which the coal is burned, a solid hearth provided with tuyeres for the admission to the burning coal of jets of air, or of commingled air and steam, channels for the circulation of air around the combustion-chamber, and bell-mouthed pipes for receiving and conducting it to the channel surrounding the combustion-chamber.

The upper retort we prefer to be of the form of a cone or frustum of a pyramid, and it is furnished with a hopper at the top, through which the fuel is fed.

The lower combustion-chamber has a solid hearth, on which the ashes are allowed to accumulate, and a little above the hearth are a series of tuyeres or openings, through which the air required for combustion is forced by means of a steam-jet or a blower of any description, and it is furnished with a door at the bottom for the removal of the ashes from time to time.

At the point where the retort and the combustion-chamber meet there is a series of lateral openings slanting upward, and leading to a space or channel which surrounds, or partly surrounds, the retort. Through these openings the generated gas passes, and it is taken off for use at any part of the aforesaid channel.

Instead of a series of openings there may be one continuous opening all around, in which case the retort is simply suspended by its top and projects downward with its lower edge free.

By the above arrangements it will be seen that the gas finds its exit as soon as formed in the hot part of the furnace, and without coming in contact with the fresh and damp fuel, while at the same time a partial distillation takes place in the retort, and the nascent steam

and hydrocarbons therefrom find their way downward also to the hot part, whereby the steam becomes decomposed by heat, and the tarry matters rectified before they pass away mingled with the ascending current.

For ordinary purposes we construct the cupola or furnace of brick-work, which may be cased outside with iron or not, and the retort, instead of being made of brick-work, may be formed in one piece of baked fire-clay or of cast or wrought iron. There are many cases, however—such as for steamboat purposes—where brick-work may be in a great measure, if not entirely, dispensed with. In such cases we construct the furnace in the form of a double shell of cast or wrought iron, thus inclosing an annular space, in which water is allowed to circulate, constituting a steam-generator or water-heater.

The tuyeres or openings may be arranged so as to perforate the outer walls and point inward; but we also sometimes make a channel crossing the middle of the hearth, which channel is perforated on each side, so as to form two sets of currents pointing outward in opposite directions.

In order to render the invention more clearly understood, we hereto annex two sheets of drawings, which we will now proceed to describe.

Figures 1 and 2 are, respectively, a cross-section and an outside elevation of a gas-producing apparatus arranged according to our improved mode of construction.

A is the upper retort; B, the lower combustion-chamber, and C the solid hearth. The ashes are allowed to accumulate, as before described, on the solid hearth, and a little above the hearth is a series of tuyeres or openings, D, which project inward, and through which the air required for combustion is forced. These tuyeres or openings are in communication, through the side channels, E, with one or more bell-mouthed pipes, F, into each of which a jet of steam is blown for the purpose of forcing in the air.

The steam accompanying the air is an advantage, as it tends to prevent the formation of clinkers; but we do not confine ourselves to the use of a steam-jet, as any effective blower

may be employed, either with or without the introduction of steam.

In order to provide for the removal of the ashes and clinkers, the apparatus is furnished with one or more doors, G, situated immediately above the hearth.

The gas is taken off, as above described, at the point where the retort and combustion-chamber meet, as shown by the direction of the arrows. This is effected through a series of lateral openings, which lead to a space or channel, H, surrounding, or partly surrounding, the retort, the gas eventually issuing by the pipe I, to be conducted to the point where it has to be burned.

The fresh fuel is fed into the apparatus by means of the hopper K, provided with a bell opening downward, as commonly practiced in the feeding of blast-furnaces; but we do not confine ourselves to this particular mode of feeding.

Figs. 3 and 4, Sheet 2, represent (to a smaller scale) a cross-section and elevation, respectively, of a modification of the above-described apparatus, in so far that the lateral openings which conduct the gas from the combustion-chamber are made into a single continuous one. In this case the retort is formed in one piece, of either cast-iron or fire-brick, and is suspended by its top, so as to leave its lower end free. Figs. 5 and 6 show also a modification of the above arrangement, in which the lower part of the retort terminates with the roof of the combustion-chamber, the channel for the escape of the gases being formed by the fuel itself in its descent.

The tuyeres or openings D have been described as perforating the outer walls and projecting inward into the combustion-chamber; but Figs. 7 and 8 show a modification by which the channel E, for conveying the steam and air, is arranged centrally, the tuyeres or openings D pointing in opposite directions, and it may be here observed that the principal object aimed at in both arrangements is to direct the current of blast into the center of the fuel, and prevent it from creeping up the side walls.

Figs. 9 and 10 also show another modification, in which two sets of central tuyeres are employed, combined with two feeding-hoppers. This arrangement will be readily understood as simply consisting of two producers made into one. In like manner three or more may be put together in one continuous line.

We have, with reference to Figs. 1 to 10, inclusive, described the gas-producing apparatus as constructed of brick-work, such brick-work being strengthened outside with iron stays or entirely cased in iron, according to option. There are, however, many cases where it is desirable to dispense with brick-work, either wholly or partially, and, as above explained, we, in such cases, construct the apparatus somewhat in the form of a vertical boiler.

Figs. 11 and 12 illustrate this arrangement, where A is the retort, as before; B, the combustion-chamber, and C the hearth, similar letters referring to similar parts as in all the figures already described.

It will be observed that the apparatus thus takes the form of a double shell, between which water is allowed to circulate, constituting either a steam-boiler or a water-heater. In this case the door G, for removing the ashes, is shown as opening downward, with the tuyeres pointing inward; but Figs. 13 and 14 exhibit a similar arrangement combined with a central tuyere and doors opening at the sides.

We claim—

In a gas-generator, the combination of the retort A, combustion-chamber B, solid hearth C, provided with tuyeres or openings D, channel E, and a bell-mouthed pipe or pipes, F, for receiving and conducting to the channel E a supply of air, or of steam and air commingled, substantially as and for the purpose set forth.

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