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(12) **Patent:** (11) **CA 285710**

(54) GAS PRODUCER

(54) GAZOGENE

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*** Note: Data on abstracts and claims is shown in the official language in which it was submitted.

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It is known that water gas or producer gas can be advantageously generated from small-sized or granular fuels in a shaft furnace by blowing the gasifying agent, such as air, steam and the like into the gas producer in such a way as to keep the whole charge in an ascending and descending or whirling movement.

The present invention relates to an improved method for producing the said gases and especially to improvements in connection with the lower part of the producer and the grate on which the materials to be gasified are arranged for carrying out the process.

According to our invention for carrying out the said process we employ a grate constructed of two superimposed sets of parallel bars, arranged in such a way that the slots of the lower set of bars are masked by the bars of the upper set that is, in staggered relation. Preferably the bars are suitably strengthened and those of the upper set are of V-shape or triangular section. To facilitate cleaning the grate, the bars may be arranged to slope in a longitudinal direction towards clinker ports or pockets, which may be disposed either laterally or centrally of the grate. The distance between the upper and lower set of bars is maintained by spacing members, preferably arranged at the ends of the bars. When a grate with a steep pitch is used, it is advisable not to arrange the bars in parallel sets, but to space the sets less apart from each other at the upper end than at the lower, thereby ensuring a more uniform distribution of the air over the whole grate area.

We will describe our invention with reference to the accompanying drawings which illustrate several embodiments thereof and are given by way of example, but this invention is not restricted thereto.

In Figures 1 and 2 we have shown in vertical section a gas producer A rectangular in cross section, the shaft of which is widened towards the top part. Figure 2 is a plan of the same and Figure 3 shows the grate bars in cross section. These are made of stiffened iron rails or the like which, as shown in Figure 3, are arranged in two layers one above the other so that the space between the bars of the upper set and those of the lower set is not more than 1.5 millimetres. The downwardly extending ribs of both sets of bars serve to carry away the heat and to cool the grate effectually. The upper bars mask the slots between the lower bars, so that small and dusty fuel cannot drop through, whereas gases can easily pass through the grate from below and through the fuel lying thereon. As is shown in Figure 1, the grate slopes in the longitudinal direction of the bars, so that the ashes can easily slide down into the clinker pockets B. For the same reason, the bars of the upper set have a triangular cross-section. The chamber C beneath the bars may be supplied with air through a passage 1, and with steam through a passage 8. Through a branch 3 air may be led to the upper part of the producer, being admitted by a pipe or passage 7 to the charging hopper D, in order to balance the pressure, and through passages 4, 5 and 6 into the bed of coal to enable the finest dust to be burned when required, which dust would otherwise be carried off by the gases leaving the producer at 10. In the production of water gas, steam may also be admitted into the resulting gas through the pipe 9 when it is desired that the gas mixture should have the highest possible content of hydrogen. The supply of fuel is regulated by the shutter a. Air is admitted into the clinker pockets B through a pipe or pipes 2, in order to burn away the unconsumed residual coal. Clinker rakes may be inserted through b and pokers or equivalent devices through c. Cooling pipes provided at x and x^1 prevent the abutments of the grate bars becoming overheated. The upper grate bars may also be made

hollow and cooled by circulating water. This arrangement of the grate and the clinker pockets has the advantage of enabling producers of large dimensions to be built.

By arranging the whole device as a travelling grate, this form of grate can be substantially improved and the process of producing combustible gases be rendered particularly economical.

In such case the method of operation is as follows: Since the clinkers formed are heavier than the coal, they settle down on to the bottom of the producer, that is, on to the travelling grate, and when the latter is set in motion, the clinkers resting thereon are drawn away from under the moving coal and are discharged through a gap, the height of which can be regulated, for instance by means of a hinged flap, at the exit end of the travelling grate. The speed of the travelling grate can be increased or diminished and the height of the gap varied according to the amount of clinker produced.

Further the material to be gasified can be admitted into the producer in a perfectly uniform manner at the front end of the travelling grate, by means of an adjustable gap or other regulating device. This affords the advantage that the admitted material, such as dry brown-coal, anthracite, and the like, mingles gradually with the incandescent charge in the producer, thereby ensuring a more uniform generation of gas and preventing the formation of heavy clouds of dust.

We have also found that the above process can be carried on without a grate, if the air or steam be blown in through nozzles or slots in the bottom part of the producer, the lower part of the producer being preferably steeply pitched in the direction of the clinker ports or pockets to facilitate the descent of the clinkers into the same.

A method of carrying out this arrangement is illustrated by way of example in vertical section in Figure 4 and in plan in Figure 5, wherein A denotes the producer, into the lower part C of which air or steam is admitted through the nozzles 1, 2, 3, 4, 5 and 6, the pressure, for the time being, being the same in each pair of nozzles, namely 1 and 4, 2 and 5 and 3 and 6 respectively. The pressure in the upper nozzles is lower than that in the lower nozzles, the adjustment being effected by setting the valves d, e and f accordingly, in order that the supply of air may be uniform through the whole of the nozzles. As is shown in Figure 5 in plan the nozzles are arranged in rows, and as shown in cross section in Figure 4 each row is connected with a main d^1, e^1 and f^1 respectively. The lower part of the producer, as far as the zone of nozzles extends, is cooled with water on the outside, whilst above that zone it is lined with refractory material. In this manner the clinkers are prevented from incrusting, and can easily be removed through clinker pockets B. The fuel is admitted, into the moving incandescent coal, by passages at D^1.

Another arrangement according to this invention is shown in vertical section in Figure 6 and in plan in Figure 7. In this case, a plurality of the units shown in Figure 4 are arranged side by side. Instead of the rows of nozzles on each side of the chambers C there are in this case slots 1,2,3 and 4, 5,6 (see Figure 7) which extend across the full width of the producer and are supplied with air or steam from the mains d^1, e^1 and f^1. That portion of the producer which is not protected by refractory material in the vicinity of the said slots is cooled by water tubes x^2, x^3 and x^4 running parallel with said slots. To give further protection to the lower part of the producer against the action of the heat, the clinkers are never completely withdrawn through the pockets B, but sufficient are

left to cover the slots 1 and 4, so that the admitted air has to pass through the bed of clinker to reach the glowing coal. The coal is fed in through the passages D^1.

The clinker can also be obtained in a molten state, by admitting the air through one or a small number of openings of large diameter instead of through a plurality of single nozzles or slots, and at such high velocity that the clinkers melt and can be drawn off in a molten state. If two nozzles, for example, be used, it is advantageous to arrange them in opposite positions. The molten clinkers collect in the lower and preferably conical portion of the producer, whence they can be drawn off in a simple manner.

We have also found that the special process of gas production, in which the fuel is kept constantly in motion, can be carried out in a highly satisfactory manner with a horizontal support for the fuel, the gasifying agents, such as air, steam and the like being admitted from below through very small openings and blown into the charge of fuel with sufficient velocity to prevent the latter from passing through the said openings, which may take the form of narrow slots or fine bores. In the latter case it is advisable to provide a large number of such bores, preferably situated in a water-cooled metal plate and adapted to be closed by suitable means enabling only a portion of them to be put out of operation. In order to keep the charge of fuel in motion, the number of openings require to operate is comparatively small, even with producers of large cross-sectional dimensions. The openings may take the form of upwardly directed holes, slots or the like, which may project like nozzles from the plate. In such case the clinkers will be deposited between the nozzles and on the plate and can be removed either by rakes or other mechanical devices. It is sometimes advantageous to arrange the openings wholly in the centre of the plate, or to

operate only those situated there, so that the fuel enters the hot zone only by degrees and disturbances resulting from the sudden disengagement of steam from damp fuel are prevented. The method of working of the said process is described with reference to Figure 8 of the drawings which illustrates a section through the lower part of the producer, the shaft area of which measures about 1.2 square metres. A water-cooled plate F is provided in which are upwardly projecting slots G each 700 millimetres long and 5 millimetres wide or thereabouts. A damper H is used for closing these slots and is partially withdrawn into the bottom chamber C. A plan of the plate is shown in Figure 9. Air, at the rate of 700 cubic metres per hour may be blown into the producer the charge consisting of glowing brown-coal coke to a depth of about 30 centimetres above the nozzles, topped to a total depth of about 1 metre with brown-coal coke containing about 5 per cent moisture, the fuel being maintained in continuous rising and falling or whirling motion. At a furnace temperature of 950° C the gas has the following composition: carbon dioxid, 1.2 per cent; carbon monoxid, 29.6 per cent; hydrogen, 2.8 per cent; methane, 1.2 per cent; nitrogen, 65.2 per cent. On steam being added to the air and the temperature raised to 1000° C, the gas has the following composition: carbon dioxid, 0.8 per cent; carbon monoxid, 30.2 per cent; hydrogen, 12 per cent; methane, 1.4 per cent; nitrogen, 55.6 per cent. When the producer is charged with brown-coal containing about 10 per cent moisture and about 10 per cent of volatiles instead of with brown coal coke, the gas obtained at 950° C consists of approximately 1 per cent of carbon dioxid, 28 per cent of carbon monoxid, 4 per cent of hydrogen, 1.5 per cent of methane and 65.5 per cent of nitrogen.

The openings may be of any desired size in cross section and the slots may be three or more as desired. Provided the openings in the centre of the plate are kept in operation, or if they are grouped into a comparatively small central area,

the fuel can be raised very quickly to 1100° C by using a strong blast of air, a valueless gas, containing up to 18 per cent of carbon dioxid being produced. At the same time, the central portion of the fuel in the producer is projected upwards, like a fountain, and falls back into the main body, which is kept in continuous whirling motion. This arrangement is especially applicable for use in cases where the gases generated in the blast stage of the manufacture of water gas cannot be employed for any useful purpose. The above described arrangement may also be arranged as a travelling grate.

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WHAT WE CLAIM AS OUR INVENTION IS:

1. In a gas producer in which granular fuel is acted upon with a gas suitable for producing fuel gas from said fuel in such a manner that the whole charge of fuel is set in motion, a grate composed of two layers of grate bars arranged in staggered relation.

2. In a gas producer in which granular fuel is acted upon with a gas suitable for producing fuel gas from said fuel in such a manner that the whole charge of fuel is set in motion, a grate composed of two layers of stiffened grate bars arranged in staggered relation, the bars of the upper set being of triangular cross-section.

3. In a gas producer in which granular fuel is acted upon with a gas suitable for producing fuel gas from said fuel in such a manner that the whole charge of fuel is set in motion, a travelling grate composed of two layers of grate bars arranged in staggered relation.

Fig. 1.

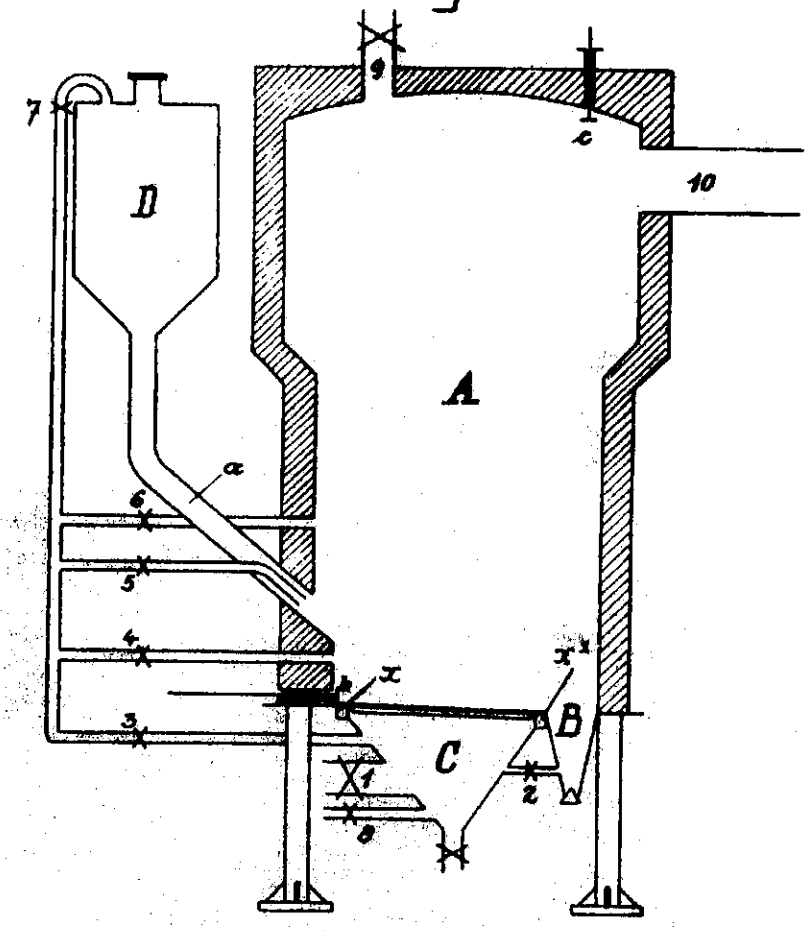

Fig. 2.

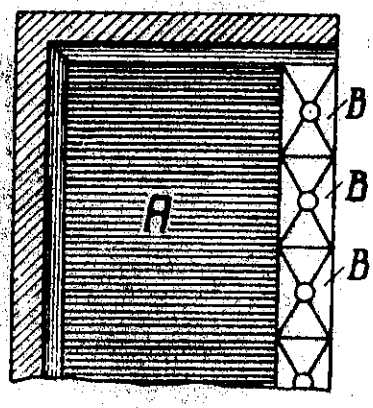

Fig. 3.

Certified to be the drawing referred to in the specifications hereunto annexed.

Ottawa, April 20th 1927.

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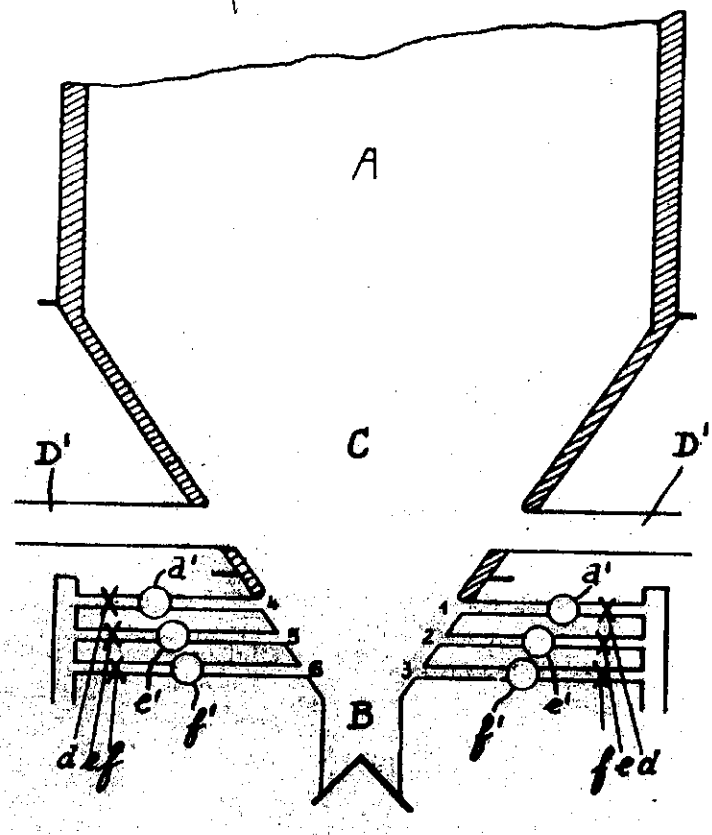

Fig. 4.

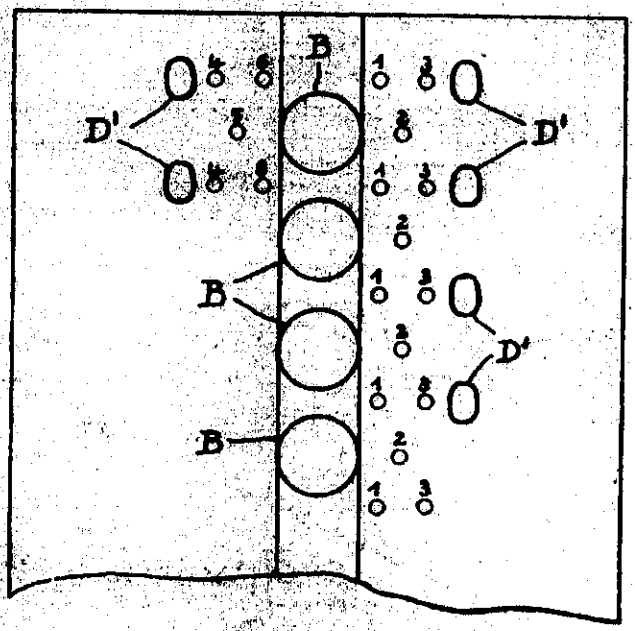

Fig. 5.

Certified to be the drawing referred to in the specifications hereunto annexed.

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Fig. 6.

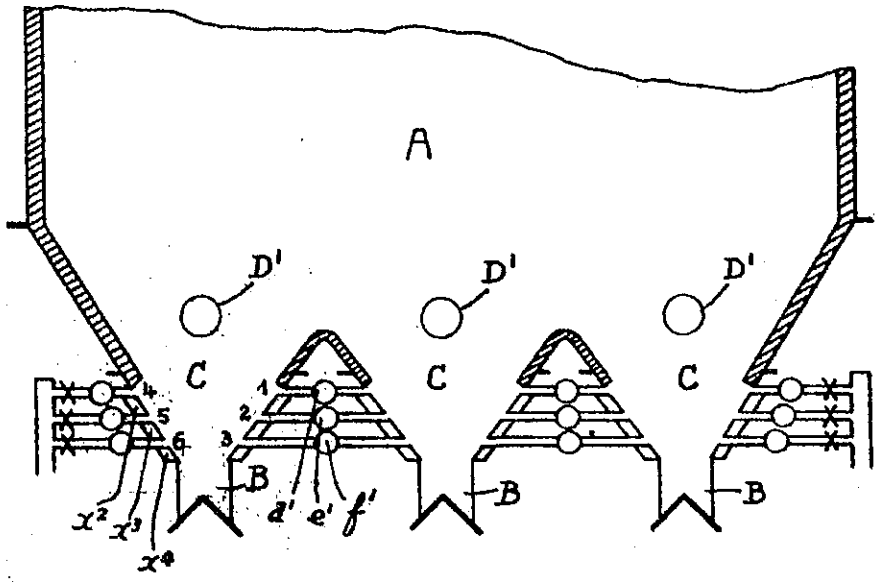

Fig. 7.

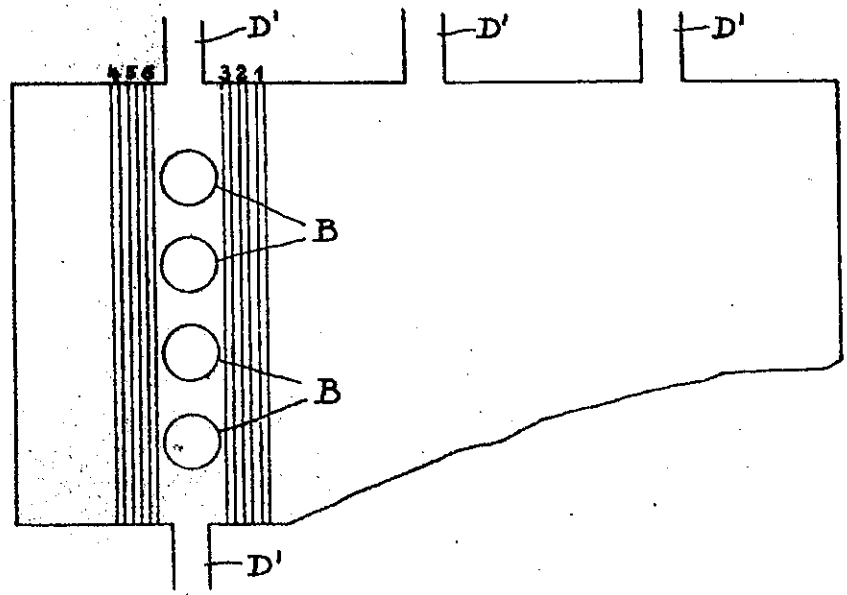

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Fig. 8.

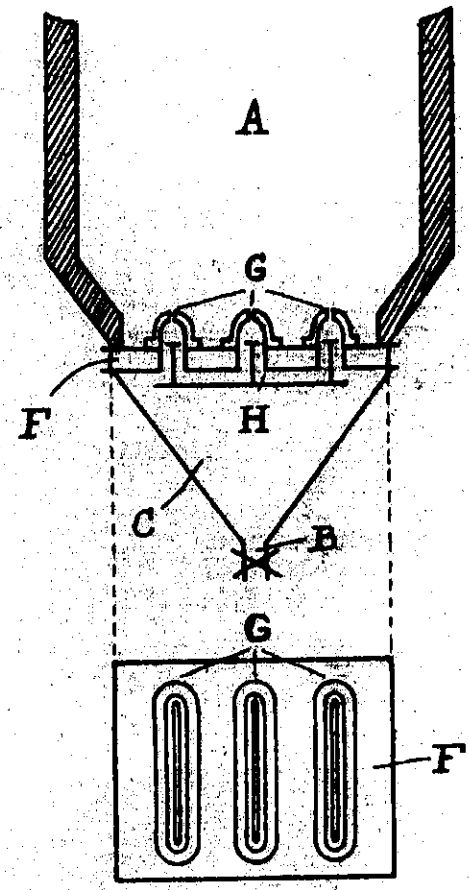

Fig. 9.

Certified to be the drawing referred to in the specifications hereunto annexed.

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