O. K. ZWINGENBERGER.

GAS PRODUCER.

APPLICATION FILED JUNE 21, 1909.

942,361.

Patented Dec. 7, 1909.

3 SHEETS—SHEET 1.

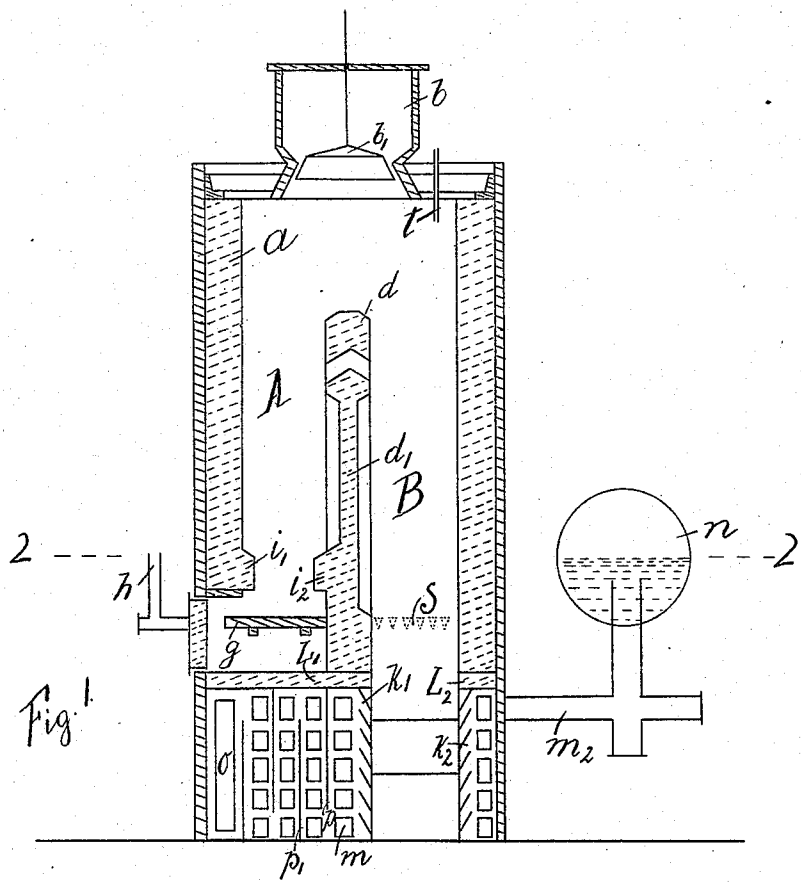

Fig. 1.

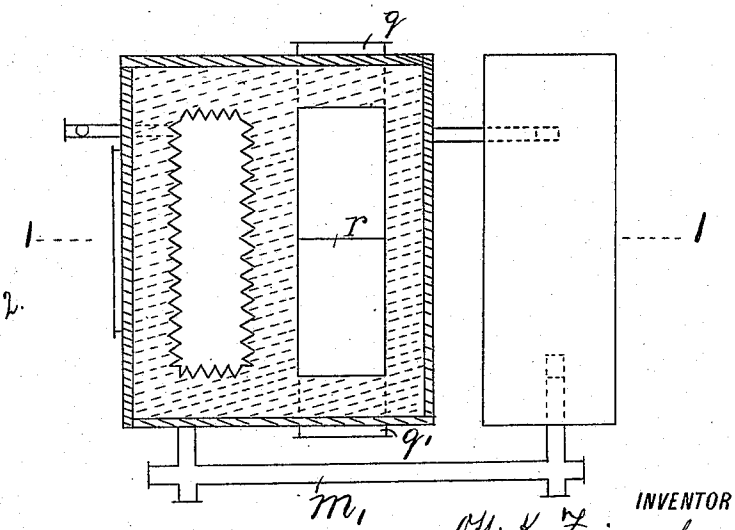

Fig. 2.

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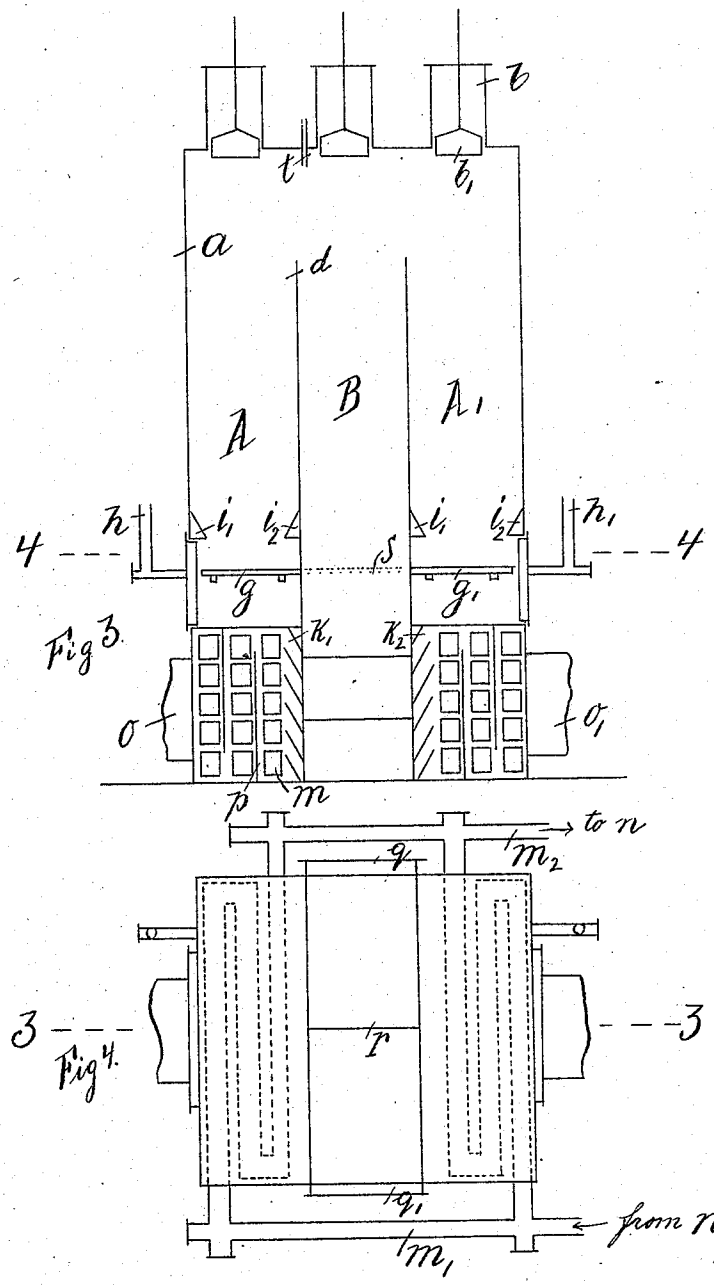

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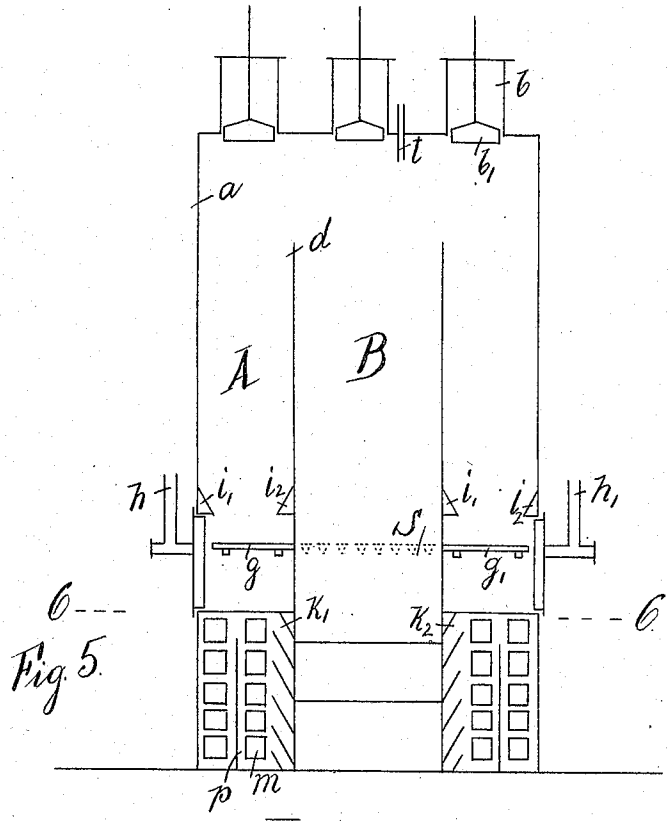

Fig. 5.

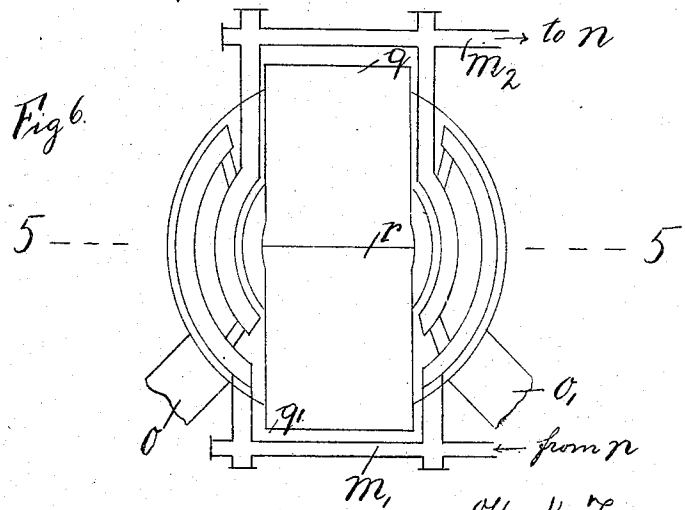

Fig. 6.

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UNITED STATES PATENT OFFICE.

OTTO KONRAD ZWINGENBERGER, OF NEW YORK, N. Y.

GAS-PRODUCER.

942,361. Specification of Letters Patent. Patented Dec. 7, 1909.

Application filed June 21, 1909. Serial No. 503,518.

To all whom it may concern:

Be it known that I, OTTO KONRAD ZWINGENBERGER, a citizen of the Empire of Germany, residing in New York, borough of Manhattan, county and State of New York, have invented certain new and useful Improvements in Combination Gas-Producers, of which the following is a specification.

This invention relates to certain improvements in coking-ovens which are intended for coking fuels and especially fuels of less value, such as bituminous coal, lignite, peat and the like, for the production of coke and gas for power, heating and illuminating purposes, free from tarry and other substances, by which the value of the gas is diminished; and for this purpose the invention consists of a combustion-chamber and a coking-chamber embodying the novel features of construction which will be fully described hereinafter and finally pointed out in the claims.

In the accompanying drawings, Figure 1 represents a vertical longitudinal section of my combination gas-producer on line 1, 1 Fig. 2 and Fig. 2 is a horizontal section on line 2, 2, Fig. 1; modifications of the combination gas-producer are demonstrated by Figs. 3–6; Fig. 3 represents a vertical longitudinal section of a square modification on line 3, 3 Fig. 4 and Fig. 4 is a horizontal section on line 4, 4 Fig. 3; Fig. 5 furthermore represents a vertical longitudinal section of a round modification of the combination gas-producer on line 5, 5 Fig. 6 and Fig. 6 is a horizontal section on line 6, 6 Fig. 5.

Similar letters of reference indicate corresponding parts.

Referring to the drawings, *a* is the combination gas-producer, forthwith simply called "oven," which is of rectangular or other shape and the walls of which are made of fire-bricks in the usual manner. At the upper end of the oven is a hopper *b* with a bell b^1 that closes the contracted end of the neck of the hopper, through which the fuel, which is to be changed into coke and gas, is supplied in suitable intervals so as to keep the oven in continuous operation.

The oven is divided into two communicating chambers by a transverse partition *d* which terminates at some distance below the top. This partition *d* is diminished in thickness at the middle portion d^1. A grate *g* is arranged at one side of the partition *d* to which air may be supplied by means of a supply-pipe *h*, the air passing to the fuel through the grate *g* after the fuel is ignited. The chamber formed above grate *g* by wall *a* and partition *d* is narrower at its lower end and the noses i^1 and i^2 extending toward the middle of the chamber are provided with scallops to allow a better access of the air to a greater surface of the fuel. At the opposite side of the partition *d* shutters k^1 and k^2 are arranged through which the gases may pass freely. The part of the oven below the plates L^1 and L^2 contains a system of water-tubes *m* filled with water which is circulating through this tube-system by means of the supply-pipe m^1 and m^2 from and to the tank *n*. By a suitable arrangement of partitions *p*, p^1, p^2, etc., the gases are made to pass in a zig-zag way along those waterfilled tubes in order to give off the heat they are carrying and to leave the coking chamber through the exit *o* to the point of use. The coke is drawn out through the openings *q* and q^1 and the column of coke is broken up while sliding downward by the saddle *r*.

The combustion chamber is formed by wall *a* and partition *d* above grate *g*. The combustion-process in this chamber may be regulated from two different standpoints as may be required by the conditions. In one case one blows in air in order to obtain the possibly greatest heat whereas in the other case one blows in air and steam and regulates its quantity according to the rules for gas-producers in order to obtain a gas of a certain mixture right from the very start. No matter how one conducts this combustion-process, owing to the fresh fuel in the upper regions of this combustion chamber tarry substances and steam are generated which pass with the combustion gases over the partition wall *d* into the chamber at the opposite side of the partition where the fuel is dried and coked by the high temperature of the gases and the heat radiating from the combustion-chamber. The gases, the tarry substances and the steam pass through the high column of glowing fuel, so that the tarry substances are decomposed and transformed into permanent gas, while the steam acts on the glowing carbon. In case one runs the combustion-chamber with the highest obtainable temperature the carbonic acid gas generated in the combustion chamber is then reduced in the coking chamber owing to the high temperature to carbon-monoxid which is of high value in gases for power-

purposes; one part of the generated coke is consumed by this reduction process.

The partition *d* has especially the purpose to separate the material to be treated in the coking chamber from that of the combustion-chamber as in the latter the least valuable fuel owing to high ash-content is burned up as otherwise the better grade of the coking-material would be affected by the combustion process and by mixing with the ash, so by separating it by means of the partition a high grade of coke is obtained and the labor to clean the coke is saved.

The gases having passed the column of glowing coke pass through the shutters k^1 and k^2 and giving off their heat while striking the water-tube-system *m* they pass along the partitions *p*, p^1, p^2, etc., and leave the oven through exit *o*. By radiation of the heat also the glowing coke gives off a great deal of its heat and the tank *n* must be of strong construction and carry all accessories like a regular boiler. The location of the boiler is of no importance and may have any place.

I am well aware that further changes in the form and proportion of parts and details of construction herein shown and described can be made without departing from the spirit or sacrificing the advantage thereof, and I therefore reserve the right to make such changes as fall within the scope of the same as I claim them part of my invention. If one considers the combination of one combustion chamber A and one coking chamber B as a unit, such units may be united together in series.

The coking-chamber B is benefited by arranging the combination furnaces in series as then the heat of 2 combustion-chambers A is acting on one coking-chamber B and the temperature in B is more uniform. The erection of such a series of combustion-furnaces will be the rule in cases where much power is wanted or the production of coke is desirable.

In cases where the conditions do not require such a series of combination furnaces it may be of advantage to build the combination-furnace in a round shape as demonstrated by Figs. 5 and 6, both chamber A and chamber B having the same central axis and then the tube like coking-chamber B being all surrounded by the combustion chamber A, or, in case a square shaped combination furnace is preferred one supplies the combination furnace with 2 combustion chambers A and A^1 acting one one coking-chamber B as demonstrated by Figs. 3 and 4. The effect of the great temperature on the carbonic acid gas, the tar and in regard to the action of the steam on the glowing coke is just as great as in the case where the combination-furnaces are united in series. In the case of two combustion-chambers and 1 coking-chamber there are no material changes in the construction; for the greater cooling effect of the water on the gas one provides for the gas two exits *o* and o^1 as seen in Fig. 3.

By providing the coking chamber with a grate *s* in about the height of grate *g* or in about the height of grates *g* and g^1 respectively one can turn the whole quantity of generated coke into water-gas by blowing in steam on top of the coking chamber by means of pipe *t* or a couple of such pipes. This quantity of steam must be regulated in regard to the quantities of steam as generated in the combustion-chambers and the whole amount of steam must be given consideration in regard to the amount of fixed carbon of the fuel.

The oven can be operated as required, either under high or low pressure. The advantages of the oven consist in the possibility to use the cheapest kind of low grade fuels as the source of heat for the coking process whereas in nearly all coking processes a great part of the generated gas must be sacrificed for this purpose; furthermore in making a good coke from low grade fuel at a low cost; in an increased yield of useful gases and the better quality of the same owing to the decomposition of the tarry substances and the facility to reduce the carbonic acid to carbon monoxid in a much greater extent than is possible in the gas-producers; in the facility to run the coking chamber by building in a grate and by blowing in steam on top of the coking chamber as a continuous water-gas producer in its plain construction and low cost of erection.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. A combination gas-producer consisting of a coking chamber and a combustion chamber, a partition extending upwardly from the bottom of the producer structure separating one chamber from the other, said combustion chamber having a grate at the lower end thereof, a water-tube system with a supply tank, located below said chambers, and constructed to cool the outgoing gases, a supply pipe at the lower part of the combustion chamber for air or a mixture of air and steam, outlets for the coke, an outlet for the gases leading from the lower portion of the producer structure and shutters located between the coking chamber and the water tubes system for the protection of the tubes.

2. A combination gas-producer consisting of a coking chamber and a combustion chamber, said combustion chamber being provided with scallops at the lower contracted end, a partition extending upwardly from the bottom of the producer structure separating one chamber from the other, a water-tube system with supply tank, located below

said chambers, and constructed to cool the outgoing gases, a supply pipe at the lower part of the combustion chamber for air or a mixture of air and steam, outlets for the coke, an outlet for the gases leading from the lower portion of the producer structure and shutters located between the coking chamber and the water tubes system for the protection of the tubes.

3. A combination gas-producer consisting of a coking chamber and a combustion chamber, a partition extending upwardly from the bottom of the producer structure separating one chamber from the other, both of said chambers mounted on an arrangement to contain a water-tube system with a supply tank as a cooling device, a supply pipe at the lower part of the combustion chamber for air or a mixture of air and steam, outlets for the coke, an outlet for the gases leading from the lower portion of the producer structure and shutters located between the coking chamber and the water-tubes system for the protection of the tubes.

4. A combination gas-producer consisting of a coking chamber and a combustion chamber, a partition extending upwardly from the bottom of the producer structure separating one chamber from the other, both of said chambers mounted on an arrangement to contain a water-tube system with a supply tank, a water-tube system with supply tank as a cooling device, longitudinal or cross sectional partitions terminating in proper distance from the bottom or ceiling of the arrangement respectively to divide the space of this arrangement thus separating the parts of the water-tube system and making the gases go around the water-tubes in a zig-zag way toward the exit.

5. A combination gas-producer consisting of a coking chamber and a combustion chamber, a partition extending upwardly from the bottom of the producer structure separating one chamber from the other, a water-tube system with supply tank, located below said chambers, and constructed to cool the outgoing gases, a grate at the lower part of the coking chamber to transform the coke generated in the same into carbon-monoxid and hydrogen by the action of steam on the glowing carbon.

6. A combination gas-producer consisting of a coking chamber and a combustion chamber, a partition extending upwardly from the bottom of the producer structure separating one chamber from the other, a water-tube system with supply tank, located below said chambers, and constructed to cool the outgoing gases, a grate at the lower part of the coking chamber, means on top of the coking chamber to supply steam to the top of the coking chamber and make it pass the whole column of glowing coke.

In testimony that I claim the foregoing as my invention, I have signed my name in presence of two subscribing witnesses.

OTTO KONRAD ZWINGENBERGER.

Witnesses:
CELIA WOLF,
G. MOTZINGER.