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G. MARCONNET.
APPARATUS FOR PRODUCING GAS.
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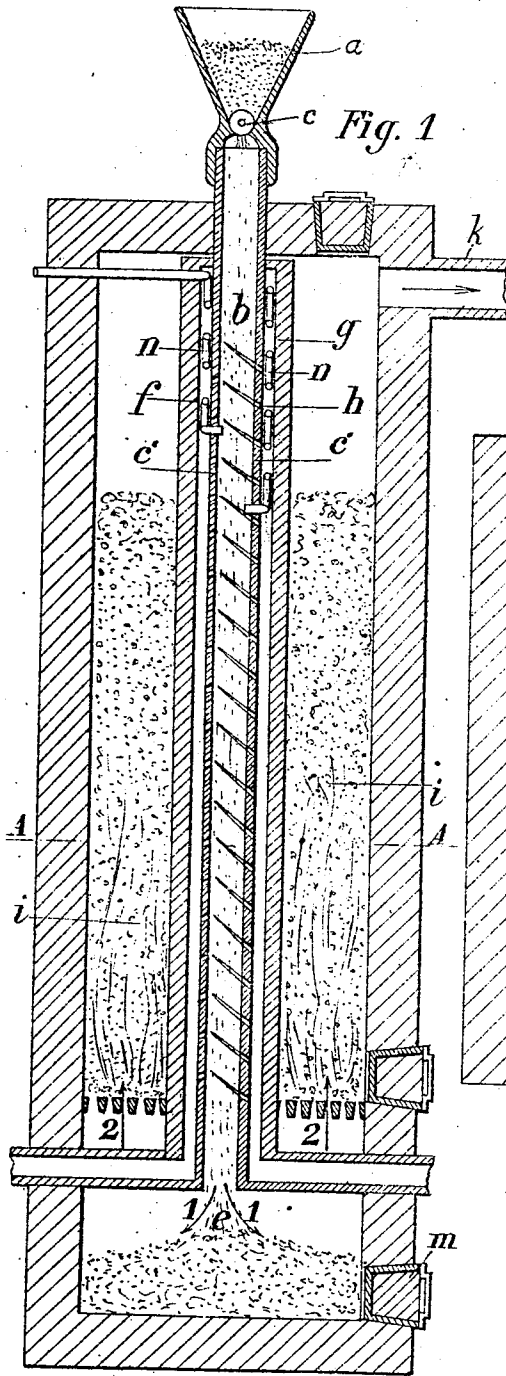
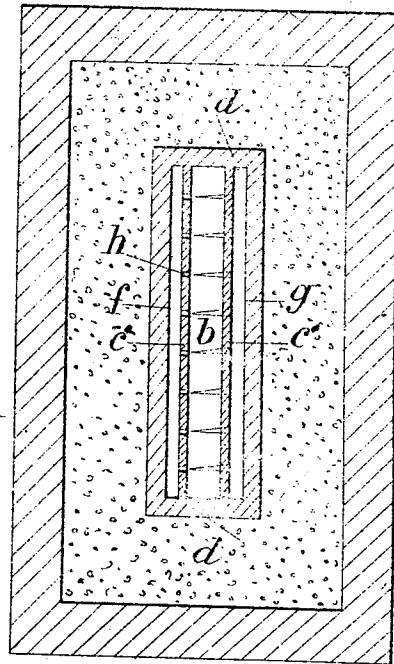


Fig. 1

Fig. 2



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APPARATUS FOR PRODUCING GAS.

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Specification of Letters Patent.

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To all whom it may concern:

Be it known that I, GEORGES MARCONNET, a citizen of the Republic of France, residing at 116 Rue de Cocqueville, Paris, France, have
5 invented new and useful Improvements in Apparatus for Producing Gas from Pulverizable Fuel, of which the following is a specification.

In gas-producers ordinarily employed it is
10 difficult to succeed in burning fuel containing a sufficiently large quantity of volatile products or fuel whose combustion results in an undue quantity of cinders or adhesive clinkers or a fuel that is of a pulverizable character.
15 This difficulty originates more particularly in the act of charging. When, as has so far been the custom, such gas-producers are charged at the one operation with the quantity of fuel that it is desired to burn in a certain time—say half an hour or an hour or
20 more—the different parts of which this charge of fuel is composed are first of all conductively heated. At the same time distillation commences in the freshest parts while
25 combustion is proceeding in the hottest layers of fuel. The presence of these parts in contact at a high temperature causes the vitrifiable parts to become, so to speak, welded together or adhere to the adjacent walls, and they ultimately choke up the apparatus.
30 If the fuel be very rich in cinder, these by collecting precisely at a point where air or gases ought to pass also obstruct the apparatus unless they are removed by means of the skilful use of a poker. Furthermore, as the
35 combustion does not take place at a sufficiently high temperature, excepting to a somewhat limited extent and with a continually-decreasing proportion of oxygen, the hydrocarbons are not completely consumed.
40 If, again, the fuel contained but little cinder, few volatile products and no adhesive clinkers, working would be quite impossible with the ordinary apparatus if the fuel were in a
45 pulverized form, as the air in that case could not penetrate the mass.

This invention relates to apparatus that admits of the complete combustion of a fuel
50 whatever its percentage of cinders and volatile products, the whole of its carbon being transformed into oxid of carbon.

The improved apparatus admits of the complete combustion of fuel in the form of a fine powder, while the cinders therefrom are
55 deposited at a part where they will cause no inconvenience.

In the improved apparatus combustion is carried out to a certain extent atom by atom over a large combustion-surface and at a high temperature in such a way that the
60 combustion of the hydrocarbons may be complete, while, on the other hand, the vitrifiable scoriæ cannot adhere together except at a part of the apparatus from which they and also the cinders can be easily moved.
65 To this end the fuel if it is not already in a powdery state is reduced into a powder, which may be as fine as desired by crushing in apparatus of any suitable kind.

In principle the process consists in allowing the pulverized fuel to fall or be mechanically distributed into the upper or inlet end of a chute-shaped conduit, the lower part or
70 exit end of which opens into a cinder-collector. The grains or fine particles of fuel are consumed in their passage through the conduit by flames from a series of burners suitably arranged in stages on the main part of
75 the chute or tube and past which the particles of fuel travel. The accompanying drawings show, by way of example, one construction of apparatus for carrying out or practically applying this principle.

In the drawings, Figure 1 is a longitudinal section, and Fig. 2 is a cross-section corresponding to the line A A of Fig. 1.
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The pulverized fuel is deposited to the amount desired for a desired time in a hopper *a* of suitable dimensions arranged at the upper end of a chamber or chute *b*, constructed of fire-clay. The bottom of this
90 hopper is provided with a distributing device *c*, that causes the fuel to fall down like a shower of rain. The distributing mechanism may, for example, be the cone of a coffee-mill. The more rapidly this cone rotates the
95 greater will be the quantity of fuel that falls down in a predetermined period. The resistance offered by the air into which this shower of fuel falls prior to its reaching the
100 first orifice *h* divides it up still further and changes it to a certain extent into a cloud, so to speak, composed of fine particles.

The conduit *b* is a chamber of rectangular cross-section, the two side walls *c'* of which are
105 separated by a few inches only and are much longer than the end walls *d*. The lower part of the conduit *b* opens into a cinder-collecting chamber *e*. The side walls *c'* form, in conjunction with the main side walls of the fire-clay chute, conduits *f* *g*, respectively, serving for the passage of air and for the passage
110

of gas to orifices *h*, arranged in stages throughout the length of the conduit *b*. The conduit *g* is fed with poor or rich gas and the conduit *f* with air. Both gas and air are subjected to
 5 slight pressure, so that they will pass out through the holes *h* in the walls *c'*, and if one of the orifices be lighted the whole group will catch alight. The conduit *b* thus forms a chimney, in which opens a large number of
 10 small burners placed quincuncially, so that powdered fuel falling in the form of a cloud has to pass through a kind of gas-gridiron of considerable height before it can reach the bottom of the conduit. The result is that on
 15 reaching the bottom each particle has been as far as possible completely consumed, that which remains in the solid state being nothing more than unchangeable or dead matter. As it is preferable that this combustion should
 20 be carried out at a high temperature and that the air and gas reaching the conduits *f* and *g* should for this purpose be first heated, it is advantageous to arrange the whole of the three fire-clay conduits in a second chamber
 25 *i*, in which a coal or coke fire is kept burning. This fire will be kept alight by the excess of air which may have traversed the conduit *b* without having been consumed and which in the example illustrated will follow the direction indicated by the arrows 1 and 2, Fig. 1.
 30 The gas will pass to the upper end of the chamber *i*, leaving its dust in the chamber *e* and in the chamber *i*, and will pass from the upper end of the chamber *i* through the conduit *k* to the purifying apparatus or washers and to the gasometer and motor. A branch pipe attached to this gasometer will be connected to the conduit *g*, so as to feed the orifices *h*. The ash and cinders that
 40 collect in the chamber *e* may be removed by means of a door *m*.

As will be understood, the gas-producer described will at any given moment contain only a small quantity of fuel, while by this
 45 process the gas is produced in a definite quantity in a continuous fashion. Hence if the gasometer be small or if the plant does not comprise a gasometer such a gas-producer will be able to follow all the variations of the
 50 load on the motor, provided that the feed of coal be at all times governed or controlled by the power of the motor. This result is easy to obtain by establishing a connection between the speed of the coal-distributor and
 55 the regulator of the motor.

In order to obtain gas richer in hydrogen, there may, as shown, be arranged in the air and gas conduits *f* and *g* coils *n*, receiving water under pressure, which being converted
 60 into steam passes, through the conduit *b* with the fuel and contributes by its intermingling with the gas and air to the production of perfect combustion.

Instead of allowing gas to enter the conduit
 65 *g* and air to enter the conduit *f* gas already

mixed with a certain quantity of air may be allowed to enter these conduits, the mixture being suitably injected in such a way that small tongues of flame shoot out from the two opposite walls *c*. In this case the
 70 air requisite for the combustion of the gas mixture at the burners and for the combustion of the coal will be supplied by separate conduits arranged in the conduits *f* and *g*.

What I claim is—

1. In a gas-producer, a conduit, means for causing jets of flame to project into said conduit, means for causing a shower of powdered fuel to pass through said conduit, means for receiving cinders at the exit end of
 80 said conduit and means for collecting gas issuing from said conduit, substantially as described.

2. In a gas-producer, a vertically-arranged conduit, means for causing jets of flame to
 85 project into said conduit, means for causing a shower of powdered fuel to fall through said conduit, a cinder-receiver at the lower end of said conduit and means for collecting gas issuing from said conduit, substantially
 90 as described.

3. In a gas-producer, a vertically-arranged conduit, gas-openings in said conduit, means for supplying gas and air under pressure to said openings, means for causing a shower of
 95 powdered fuel to fall through said conduit, a cinder-receiver at the lower end of said conduit and means for collecting gas issuing from said conduit, substantially as described.

4. In a gas-producer, a vertically-arranged
 100 conduit of rectangular shape in cross-section and two of whose walls are pierced with numerous small holes, a gas-chamber with which the holes of one said wall communicate, an air-chamber with which the holes of the
 105 opposite wall communicate, means for supplying gas and air respectively to said chambers, means for causing a shower of powdered fuel to fall through said conduit, a cinder-receiver at the lower end of said conduit
 110 and means for collecting gas issuing from said conduit, substantially as described.

5. In a gas-producer, a vertically-arranged conduit of rectangular shape in cross-section and two of whose walls are pierced with
 115 numerous small holes, a gas-chamber with which the holes of one said wall communicate, an air-chamber with which the holes of the opposite wall communicate, means for supplying gas and air respectively to said chambers, means for heating said air and gas, means for causing a shower of powdered fuel to fall through said conduit, a cinder-receiver at the lower end of said conduit and means
 120 for collecting gas issuing from said conduit, substantially as described.

6. In a gas-producer, a vertically-arranged conduit of rectangular shape in cross-section and two of whose walls are pierced with
 130 numerous small holes, a gas-chamber with

which the holes of one said wall communicate, an air-chamber with which the holes of the opposite wall communicate, means for supplying gas and air respectively to said chambers, means for heating said air and gas, means for delivering water to said conduit, means for causing a shower of powdered fuel to fall through said conduit, a cinder-receiver at the lower end of said conduit and means for collecting gas issuing from said conduit, substantially as described.

7. In a gas-producer, a vertically-arranged conduit of rectangular shape in cross-section and two of whose walls are pierced with numerous small holes, a gas-chamber with which the holes of one said wall communicate, an air-chamber with which the holes of the opposite wall communicate, means for supplying gas and air respectively to said chambers, a heating-chamber in which said conduit and said air and gas chambers are located, a fire-grate in said heating-chamber, means for causing a shower of powdered fuel to fall through said conduit, a cinder-receiver at the lower end of said conduit and means for collecting gas issuing from said conduit, substantially as described.

8. In a gas-producer a vertically-arranged outer casing, a fire-grate in said casing, a conduit centrally arranged within said casing, passing through the top thereof and extending through and slightly below said fire-grate, said conduit having its wall throughout that portion thereof within said casing above said fire-grate pierced with two series of small holes, a chamber communicating with one said series of holes, a second chamber communicating with the other said series of holes, pipes supplying air and gas respectively to said chambers, a hopper for powdered fuel at the upper end of said conduit, a device con-

nected with said hopper adapted to allow the fuel therefrom to fall in a shower into said conduit, a door at the bottom of said casing through which cinders collecting below the open lower end of said conduit can be withdrawn, and a pipe at the upper end of said casing through which the gas produced may be withdrawn, substantially as described.

9. In a gas-producer a vertically-arranged outer casing, a fire-grate in said casing, a conduit centrally arranged within said casing, passing through the top thereof and extending through and slightly below said fire-grate, said conduit having its wall throughout that portion thereof within said casing above said fire-grate pierced with two series of small holes, a chamber communicating with one said series of holes, a second chamber communicating with the other said series of holes, pipes supplying air and gas respectively to said chambers, a hopper for powdered fuel at the upper end of said conduit, a device connected with said hopper adapted to allow the fuel therefrom to fall in a shower into said conduit, a door at the bottom of said casing through which cinders collecting below the open lower end of said conduit can be withdrawn, a pipe at the upper end of said casing through which the gas produced may be withdrawn, and water-tubes located in said air and gas chambers adapted to discharge water into said conduit, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

GEORGES MARCONNET.

Witnesses:

LOUIS GARDET,
ARCHIBALD R. BAKER.