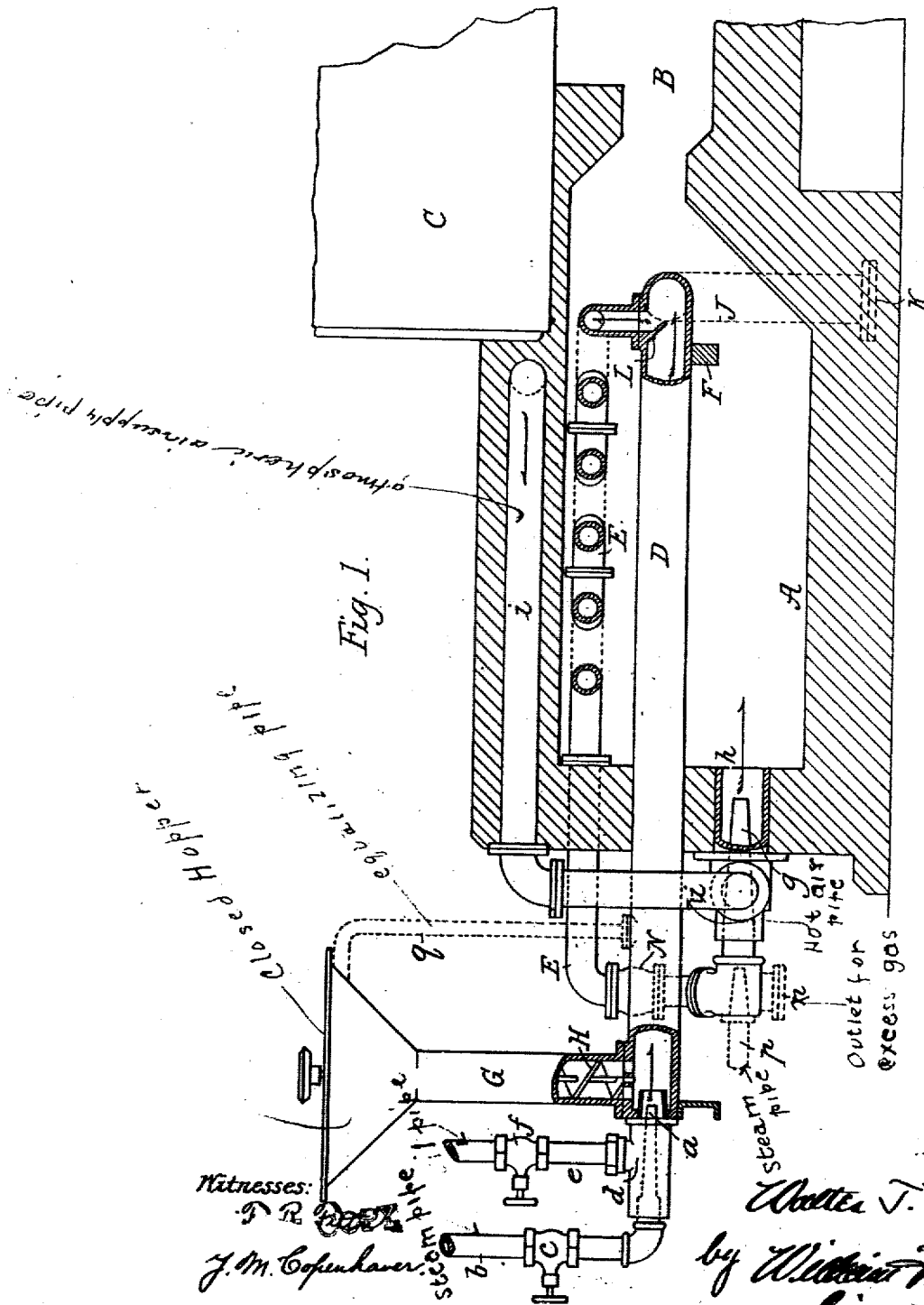


W. T. GRIFFIN.
PROCESS FOR MAKING AND BURNING FUEL GAS.
APPLICATION FILED DEC. 12, 1903

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 3.

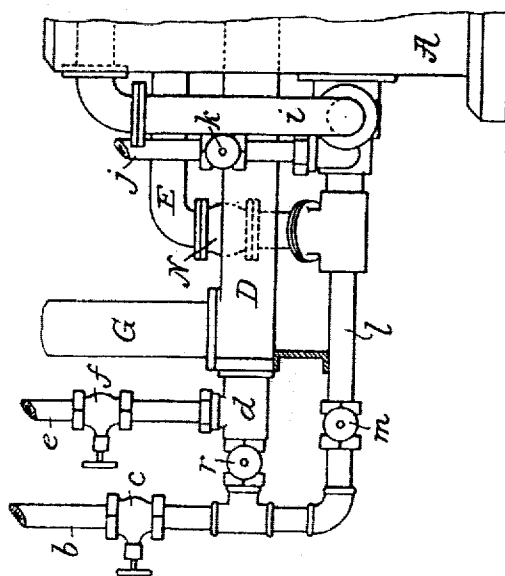
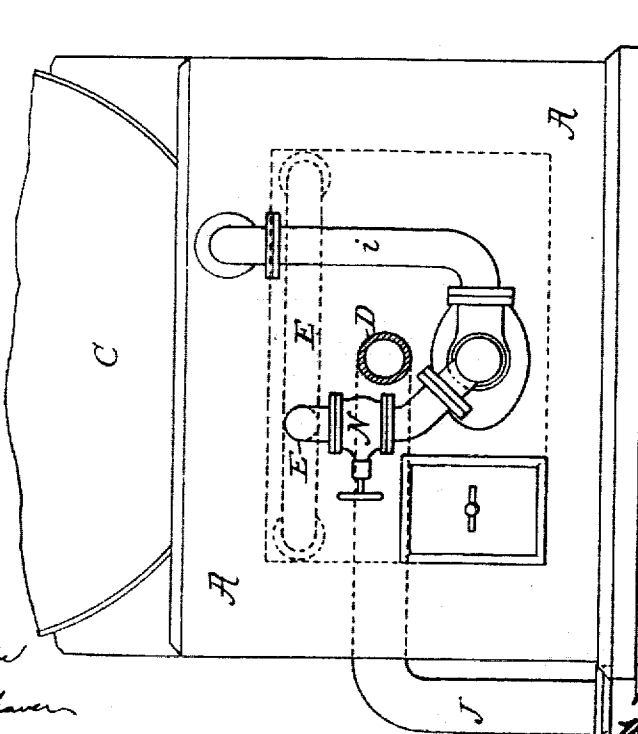


Fig. 2.



Witnesses:

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By
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UNITED STATES PATENT OFFICE.

WALTER T. GRIFFIN, OF PLAINFIELD, NEW JERSEY.

PROCESS FOR MAKING AND BURNING FUEL-GAS.

No. 816,314.

Specification of Letters Patent.

Patented March 27, 1906.

Application filed December 12, 1903. Serial No. 185,000.

To all whom it may concern:

Be it known that I, WALTER T. GRIFFIN, a citizen of the United States, and a resident of Plainfield, county of Union, and State of New Jersey, have invented certain new and useful Improvements in Processes for Making and Burning Fuel-Gas, of which the following is a specification.

This invention relates to an improved process for making a fuel or burning gas for heating purposes—as, for instance, for use in furnaces of steam-generators and the like. The gas, however, may be enriched by the addition of suitable hydrocarbons or burned in presence of a carbon for use as an illuminant.

In practicing the process a hydrocarbon or a suitable carbonaceous material—such as coal, peat, sawdust, or the like—in pulverized or comminuted condition is fed to or mixed with water or steam under pressure, superheated steam being preferred, and then subjected to high heat in a retort or retorts, so that the fine carbonaceous material or hydrocarbon is gasified and the aqueous vapor of the steam is brought to the point or almost to the point of dissociation, forming in the main a mixture of carbonic oxid and hydrogen and making, in effect, a water-gas, which afterward by the addition of atmospheric air or oxygen may be burned, producing great heat.

An improved apparatus adapted to carry out this process is shown in the accompanying drawings, in which—

Figure 1 is a sectional elevation; Fig. 2, an end view, partly in section; and Fig. 3, a sectional elevation of a modified arrangement.

The improvements are shown in connection with a brick furnace A, lined with fire-brick, and a flue B of an ordinary cylindrical steam-generator C. In the furnace is arranged a longitudinal main retort D, connected at its inner end with a secondary retort or gas-conduit E in the form of a horizontal crosswise-extending coil. The retort D may be a comparatively large metallic tube covered, if desired, with a refractory material and supported by the brickwork of the furnace, as by its front wall, and by a cross-bar F at its inner end. The retort D extends through the front wall of the furnace and at

its outer end is provided with an injector-nozzle *a*, that is connected to a steam-supply pipe *b*, having a valve *c*. This injector may be supplied with an oil-chamber *d*, connected with a reservoir of oil by a pipe *e*, that is controlled by a valve *f*. The same end of the retort D is connected with a vertically or otherwise arranged feed-tube G, having a rotative feeding-worm H for supplying needed quantities of a powdered carbonaceous material—such as coal, peat, sawdust, and the like—the arrangement being such that either a liquid hydrocarbon, a powdered carbonaceous material, or a mixture of both may be supplied to the steam or forced by the steam passing from the injector-nozzle *a* to be carried with the steam along and through the retort D. The gas-conduit E also extends through the front wall of the furnace, is controlled by a valve N, and terminates in a nozzle *g* of an injector or fuel-burner *h*, projecting into the furnace. This injector is also connected with an atmospheric air-supply pipe *i*, conducted through the walls of the furnace, so that the air shall become heated therefrom before entering the injector or burner. This pipe may also have a valve, if desired, to regulate the volume of air supplied to the fuel-gas being injected into the furnace for burning.

In operating this apparatus a preliminary fire of any description is started in the furnace, either by injection of oil and steam or air or by other means, sufficient to more or less highly heat the main retort D and its communicating conduit E. When these are properly heated and a supply of steam has been provided—say in a small auxiliary boiler—the valves *f* and *c* will be opened to allow oil and steam to be injected together along and through the heated retort D, which by means of its heated wall will vaporize the oil and attenuate the aqueous vapor. This gas and vapor will pass as a mixture through the heated conduit E, become still more vaporized and attenuated to issue from the burner *h* with the hot air from the pipe *i* into the furnace and be ignited and burned, whereupon the preliminary fire will be allowed to die out. The heat of the burning fuel supplied by the burner gradually increases the heat of the retort and the gas-conduit until the heat is suf-

ficient to practically dissociate the gases of the aqueous vapor within the retort and conduit, forming by reason of the presence of the carbon mixed therewith carbon monoxid and hydrogen, which then issue from the burner *h* to be burned, and this will continue so long as the carbon and steam are admitted to the retort. An exceedingly-fierce flame and under considerable pressure is the result capable of carrying to a long distance through the furnace flue or flues *B*, so that steam is quickly generated and maintained in the boiler *C*. When this occurs, the steam supplied to the injector-nozzle *a* may be taken from this boiler and the auxiliary boiler cut off. At the same time that the retort and conduit are being heated the air-pipe *i* is also becoming heated from radiation through the furnace-walls, so that highly-heated atmospheric air is supplied to the burner *h* to support combustion of the fuel-gas in the furnace.

The powdered carbonaceous material may be fed to the injector-nozzle *a* and be injected along with the steam through the retort in lieu of the liquid hydrocarbon, or in addition thereto, if desired. It is preferred, however, after the interior of the furnace has become suitably hot to gradually cut off the supply of oil (where oil is used) from entering the retort with the steam and to then depend wholly upon the feed of carbonaceous material from the feed-tube *G* for the supply of carbon.

Where it is intended to utilize the powdered carbonaceous material for injection with the steam, the inner end of the retort *D* may communicate with a gas-tight pocket *J*, leading to the interior of the furnace, in which pocket the undecomposed matter or ash may collect instead of passing to the burner and be from time to time blown out of the pocket or removed therefrom by opening a suitable valve or plate *K* at the lower end, and the inner end of the pocket may have a deflector *L* to prevent the onward passage of such solid matter into the conduit or burner.

Should the fuel-gas be made in greater quantities than is needed for combustion in the furnace—as when a higher percentage of carbon is supplied, for instance—the excess may be led off by a connection *n* (see dotted lines, Fig. 1) to another or distant furnace or other structure and there be used or stored.

If the excess gas be sent to storage, it may be burned in the presence of a stack of incandescent coal or coke and treated, if need be, with a hydrocarbon to render it capable of being used as an illuminant and be otherwise treated, as is usual with such gases. Where superheated steam is to be used with the carbon supplied to the retort *D*, the steam-generator may be supplied with any usual form of steam-superheater and the steam conduct-

ed from it to the injector-nozzle *a*, with the result of greater efficiency in the apparatus.

In lieu of the atmospheric air supplied by 65 the pipe *i* for supporting the combustion of the gases issuing at the burner *h* or in addition thereto a jet of steam may be supplied by a nozzle *p*, (see dotted lines, Fig. 1,) and this jet of steam may also aid in drawing the 70 gases through the retort or retorts and prevent back pressure therein, tending to stop the free supply of the carbonaceous material to the retort.

The pressure on both sides of the carbon 75 being fed, say, by the worm *H* in the feeder *G* may be equalized by providing an equalizing-pipe *q*, (see dotted lines, Fig. 1,) leading from the retort *D* to the hopper *G'* of the feeder on the upper side of the carbon therein, the hop- 80 per being a closed one and the carbon fed thereto in a manner common in feeding material to structures working under pressure.

While the retort *D* and conduit *E* have been referred to as separable connected 85 parts, it is obvious the two may be made up of a single sufficiently long conduit and of uniform diameter.

The connections with the burner *h* (see Fig 3) may be provided with an oil-supply cham- 90 ber *o*, connected to the reservoir of oil by a pipe *j* and controlled by a valve *k*, and the fuel-gas nozzle *g* may also be connected with the steam-pipe *b* by a branch pipe *l*, having a valve *m*, by which oil and steam may be in- 95 jected for burning in the furnace in lieu of the fuel-gas conducted by the conduit *E* or for use in providing the preliminary fire to initially heat the retort and conduit. In such case, however, a valve *r*, interposed between 100 the steam-pipe *b* and the injector-nozzle *a*, should be closed. So, too, oil from the chamber *o* may be used to supplement the fuel-gas at the burner *h*.

The particular form and arrangement of 105 apparatus herein shown may be varied to suit the kind of furnace or steam-generator with which it is employed.

What is claimed is—

1. The herein-described process of gener- 110 ating and burning fuel-gas, which consists in passing a mixture of steam and finely-divided carbonaceous material through a heated zone, conducting the formed gases through the zone, introducing a supply of oxygen into 115 the current of gases, and burning the mixture beneath the zone to maintain the same, as set forth.

2. The herein-described process of gener- 120 ating and burning fuel-gas, which consists in passing a mixture of superheated steam and finely-divided carbonaceous material through a heated zone, conducting the formed gases back through the zone to a point outside the

same, introducing a supply of oxygen into the current of gases, then conducting the mixture under the zone and burning the mixture, as set forth.

5 In testimony whereof I have hereunto signed my name, in the presence of two attesting witnesses, at New York, in the county

of New York and State of New York, this 9th day of December, 1903.

WALTER T. GRIFFIN.

Witnesses:

S. M. JANNEY.

F. LICARI.