

R. GEIPERT.
METHOD OF HEATING COKE OVENS AND THE LIKE.
APPLICATION FILED APR. 10, 1914.

1,208,134.

Patented Dec. 12, 1916.
2 SHEETS—SHEET 1.

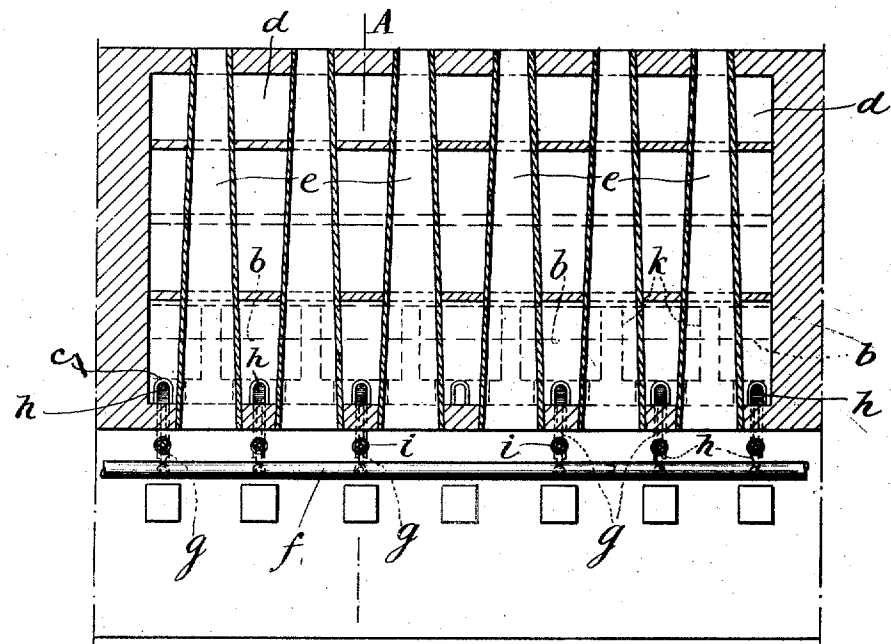
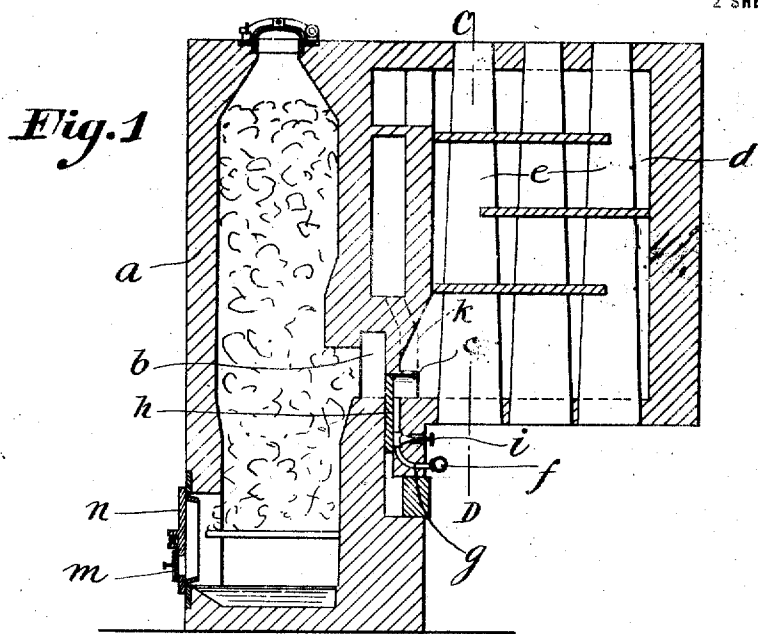


Fig. 2

Witnesses
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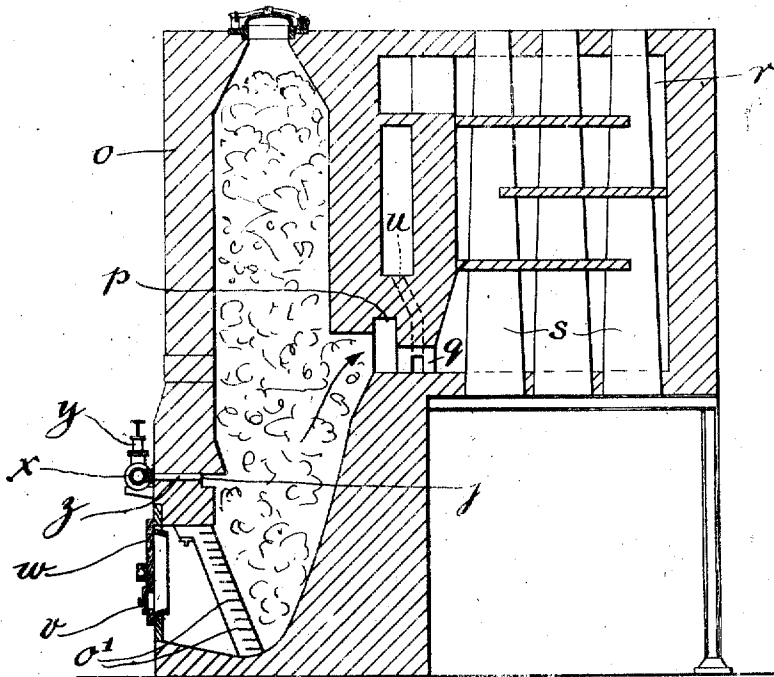


Fig. 3

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UNITED STATES PATENT OFFICE.

RUDOLF GEIPERT, OF BERLIN, GERMANY, ASSIGNOR TO DESSAUER VERTIKAL OFEN
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METHOD OF HEATING COKE-OVENS AND THE LIKE.

1,208,134.

Specification of Letters Patent.

Patented Dec. 12, 1916.

Application filed April 10, 1914. Serial No. 820,925.

To all whom it may concern:

Be it known that I, RUDOLF GEIPERT, a subject of the Emperor of Germany, and resident of Berlin, Germany, have invented certain new and useful Improvements in Methods of Heating Coke-Ovens and the like, of which the following is a specification.

The invention relates to a mode of operation of coke ovens with closed retorts externally heated and refers particularly to a process of heating coke ovens with either producer gas, or illuminating gas such as is obtained, for instance, in the coking of coal. The retorts of the furnaces for the destructive distillation of coal for the production of coke and illuminating gas are usually heated with producer gas which is usually generated from coke or coal in producers connected with the furnaces or ovens. It has been repeatedly suggested that illuminating gas obtained by the distillation process might be used occasionally for the heating of the retorts, especially at those times when the market price of the coke advises such a change from the standpoint of economy. In operating this heating of the distilling retorts by alternately burning either producer gas or illuminating gas on a large scale, it has been found relatively easy to change from the burning of producer gas to the burning of illuminating gas; great difficulty has been encountered, however, in the reverse process, viz., the change from the use of illuminating gas to the use of producer gas, because during the burning of illuminating gas the producers are shut down and must be started up anew for heating the retorts again with producer gas. In the construction of the means used up to the present time for effecting such heating with either producer gas or illuminating gas, there has furthermore been a permanent risk from danger by explosion, inasmuch as during the period of burning illuminating gas said gas escapes through leaks in the valves or the like means into the inactive producer, as well as into the channels or flues leading to and connected with said producer, thereby forming explosive gas mixtures with the air in said channels or flues and the producer itself. The present invention obviates these disadvantages by not shutting down the producer completely during the burning of the illuminating gas and on the contrary by

generating such amount of producer gas therein that the producer as well as the channels connected with same remain at a high temperature. The producer gas thus obtained is mixed with the illuminating gas either before or after entering the fire chamber of the coke oven to be burned up therein.

In the present invention the operation of heating the retorts by using different kinds of fuel gas is carried out according to the following principles: 1. During the period of heating by burning producer gas exclusively, the channels, admitting illuminating gas to the fire chamber of the oven, are closed, whereas the valves or like means, regulating the admission of the primary air to the producers, are rather widely open. 2. During the period of heating by burning illuminating gas the channels conducting said illuminating gas into the fire chamber of the oven are opened for the passage of the necessary quantity of gas, whereas the valves, admitting the primary air to the producers, are opened just enough to admit as much air as is necessary for the generation of a small quantity of producer gas.

In operating according to the aforesaid principles one can change without difficulty from the use of illuminating gas to that of producer gas by closing the channels for the illuminating gas and by furthermore widely opening the valves for the primary air for the producer; both methods of heating may thus be followed alternately as quickly and as often as may be desired. By this mode of operation, as described, all danger of explosion is avoided because during the period of heating with illuminating gas said gas will strike all parts of the producer, as well as the channels connected with the same, when the said producer and channels are highly incandescent; under such conditions explosive mixtures of gas and air are not formed. The quantity of producer gas needed, during the period of using illuminating gas, to maintain a high temperature within the producer and the channels connected with the same may be easily estimated according to the requirements of the situation and said quantity may be so regulated that a definite proportion of the heat necessary to operate the coking oven is furnished by the producer gas. The even discharge of small quantities of producer gas into the coke oven is rather

difficult however during the removal of clinkers from the producer. As the doors of the producers are open during this operation much air enters the producers, resulting in the generation of great quantities of producer gas; if under these conditions an excess of producer gas enters the exit flue of the oven its mixture with air may readily prove explosive. To prevent occurrences of this kind either the channels for the illuminating gas or those for conducting the producer gas are throttled or a part of the same is temporarily closed. The construction of the means employed may also be so arranged that, during the period of heating with the illuminating gas, the producer gas enters permanently through one or several narrow flues, said flues offering rather considerable resistance to the passage of great volumes of gases into the fire chamber of the coking oven, thus causing an accumulation of gases in the flues and the producer and keeping down the formation of any considerable quantities of producer gas because of the back pressure.

In the following I shall describe and illustrate in connection with the accompanying drawings, one form of oven adapted for use in accordance with the present invention, the device shown in the drawings representing by way of example, one method of constructing a coke oven with vertical retorts, wherein, during the period of heating with illuminating gas, only one of the channels between the producer and the fire chamber is permanently open to serve as an exit of the gases into the oven.

In the drawings, Figure 1 is a vertical sectional view of the oven along the line A—B of Fig. 2; Fig. 2 is a vertical sectional view along the line C—D of Fig. 1; and Fig. 3 is a vertical sectional view of an oven showing a modified form of construction for carrying out the heating process.

Similar letters of reference indicate similar parts throughout the several views.

The arrangement disclosed in Figs. 1 and 2 shows a coking oven with vertical retorts which is connected to a gas producer *a* by means of a main flue *b*, the latter branching out into several lateral flues *c* connecting directly with the fire-chamber *d* containing the retorts *e* to be heated externally for the coking process. A main-pipe *f* is provided below the oven to conduct the illuminating gas through branch pipes *g* which open into the flues *c* directly behind the shut-off plates *h*; as the situation may require the pipes *g* are closed or opened by means of valves *i*. The air for combustion in the fire-chamber *d* is introduced by means of flues *k* opening into the upper part of the lateral flues *c*. The air for the gasifying process in producer *a* is admitted in any of the well known ways for instance through damper *m* in the

door *n* of the producer. With this arrangement as described only part of the lateral flues *c* is in connection, by means of the branch pipes *g*, with the main pipe *f* for the illuminating gas, preferably the three flues *c* in the front, and those in the rear are thus connected, while the flue *c* in the middle is permanently in connection with flue *b* for the admission of the producer gas.

It is obvious from the above that Figs. 1 and 2 represent an installation of a coking oven in which during the period of heating with illuminating gas six flues *c* are supplied with illuminating gas from the main pipe *f*, while the middle flue *c* introduces producer gas into the fire chamber. Six seventh ($\frac{6}{7}$) parts of the fuel supply gas are thus furnished by illuminating gas, the remaining one seventh ($\frac{1}{7}$) being provided by producer gas. It is evident that in this arrangement during the period of burning illuminating gas, the producer gas can enter the fire chamber *d* only through the middle flue *c* and as it meets considerable resistance during the passage through this narrow channel, a considerable generation of producer gas is prevented *ab initio* from entering the fire chamber even during the removal of clinkers from the producer. It is evident that the construction may also be arranged to have two or more flues *c* connected with the fire chamber *d* for conducting producer gas to the same during the period of burning illuminating gas if it is preferable to have a corresponding part of the heating effect obtained by means of producer gas; by connecting, or disconnecting respectively, a certain number of the flues *c* as well as opening or closing the valves *i* in pipes *g* connecting with main pipe *f*, the supply of gases to the furnace chamber *d* may be carried out so that the optional heating by either kind of gas may be easily effected and regulated.

The construction shown in Fig. 3 discloses a further development of the present construction for the purpose of avoiding, during the period of burning illuminating gas, the formation of luminous flames which are of great handicap in the observations to establish the temperature of the retort from the behavior of the flames in the fire-chamber. This latter purpose of the invention is achieved by passing the illuminating gas prior to its entrance into the fire chamber *d* of the oven, through the incandescent fuel and to thus free it of its illuminant components. By this method of eliminating the latter kind of gases, the producer gas and the now de-illuminated gas from the retorts are thoroughly mixed before entering the fire-chamber. It is of course understood that in passing the illuminating gas through the incandescent layer of fuel in the pro-

ducer care must be taken that the primary air necessary for the generation of the producer gas does not meet with the illuminating gas; bad results from this source of difficulties are avoided if the zone of incandescent fuel between the entrance of the illuminating gas into the producer and the entrance of the primary air is of sufficient height. The coking oven with vertical retorts, as shown in Fig. 3 is also provided with a producer *o* like that shown in Figs. 1 and 2, said producer *o* being connected by a channel *p* and a series of lateral flues *q* with the fire chamber *r* in which the retorts to be heated are located. The introduction of the air required for the combustion of the gases in the fire-chamber *r* takes place by means of the flues *u* entering at the upper part of lateral flues *q*. The primary air required for the generation of the producer gas is introduced in the well known way through the damper *v* in the door *w*. The main pipe *x* for the illuminating gas is provided with a valve *y*; contrary to the construction shown in Figs. 1 and 2 said main pipe is not located in the rear of the producer but runs along the front side of producer *o*. One or a plurality of horizontal pipes or flues *z* connect the gas main pipe *x* with the chamber of producer *o*. The orifices *j* of the pipes *z* are at such a height above the grate *o'* of the producer that a column of incandescent fuel is between the respective entrances of the primary air and the illuminating gas and consequently the primary air does not meet with the illuminating gas introduced into the producer. During the period of burning the producer gas, the valve *y* of the main gas pipe *x* is closed, whereas the damper *v*, regulating the admission of the primary air into the producer, is widely opened to admit of the generation of the quantity of producer gas necessary for heating the coke oven. During the period of burning illuminating gas, the damper *v* is open only a little to admit only a small quantity of primary air and to consequently generate only such small quantity of producer gases as will keep the fuel in the producer incandescent. The illuminating gas flows through the flues *z* and passes through the incandescent fuel in the producer *o* leaving finally, mixed with the small quantity of producer gas, through the flues *p* and *q* into the fire-chamber *r*. The illuminating gas, in passing through the incandescent fuel in the producer, is freed of all the components burning with a luminous flame, thus obtaining in the fire-chamber *r* non-luminous flames raising no difficulties for the observation of the temperature of the oven.

The construction represented by Fig. 3 is without the shut-off plates, provided in the

flues *o* of Figs. 1 and 2, for the purpose of preventing, during the period of burning illuminating gas, an undesirable generation of producer gas when the clinkers are being removed from the producer. In the arrangement shown in Fig. 3, the supply of illuminating gas is nearly or completely interrupted by means of valve *y* whereby no considerable quantity of illuminating gas may enter fire-chamber *r*.

This modified way of carrying out my process of optionally heating the coke ovens and the like furnaces by either producer gas or illuminating gas allows also the use, instead of illuminating gas, of any other gas the combustion of which will give a luminous flame, as for instance, the nowadays largely and economically made producer gas from brown coal or lignite which in passing through the incandescent zone of the producer is perfectly deluminated by the present modification and therefore does not burn in the fire chamber with a luminous flame.

It is understood that whenever I use the term "illuminating gas" in the specification as well as in the attached claims I mean to embrace all gases, components of which by combustion give luminous flame and that such term "illuminating gas" embraces all such gases whatever their origin or manner of production. I am furthermore 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 of the invention 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 as part of my invention.

What I claim and desire to secure by Letters Patent is:—

1. In the method of heating coke ovens and the like by alternately burning producer gas or illuminating gas in the same, continuously generating during the periods of burning illuminating gas a quantity of producer gas sufficient to maintain the high temperature of the producer proper as well as of the flues connecting said producer and the coke oven.

2. In the method of heating coke ovens and the like by alternately burning producer gas or illuminating gas in the same, continuously generating during the periods of burning illuminating gas a quantity of producer gas sufficient to maintain the high temperature of the producer proper as well as of the flues connecting said producer and the coke oven, mixing the producer gas and the illuminating gas before their entrance into the coking oven and burning this mixture in the coke oven.

3. In the method of heating coke ovens and the like by alternately burning producer gas or illuminating gas, continuously generating during the periods of burning illuminating gas a quantity of producer gas, mixing said gas with the illuminating gas before their entrance into the coke oven, burning the mixture thus obtained in the coke oven, and preventing explosions of the obtained gas mixture during the removal of clinkers from the producer by suitably regulating the flues for the admission of the illuminating gas.

4. In the method of heating coke ovens and the like by alternately burning producer gas or illuminating gas, continuously generating during the periods of burning illuminating gas a quantity of producer gas, mixing said gas with the illuminating gas before their entrance into the coke oven, burning the mixture thus obtained in the coke oven, and preventing explosions of the obtained gas mixture during the removal of clinkers from the producer by suitably regulating the flues for the admission of the producer gas.

5. In the method of heating coke ovens and the like by alternately burning producer gas or illuminating gas, continuously generating during the periods of burning illuminating gas a quantity of producer gas, mixing said gas with the illuminating gas before their entrance into the coke oven, burning the mixture thus obtained in the coke oven, and preventing explosions of the obtained gas mixture during the removal of clinkers from the producer by suitably reg-

ulating the flues for the admission of both illuminating and producer gas.

6. In the method of heating coke ovens and the like by alternately burning producer gas or illuminating gas in the same, continuously generating during the periods of burning illuminating gas a quantity of producer gas sufficient to maintain the high temperature of the producer proper, mixing a relatively small proportion of the producer gas with the illuminating gas before their entrance into the coke oven, burning the mixture thus obtained in the coke oven, choking the free passage of the producer gas to the oven and preventing formation of any considerable quantity of producer gas by the back pressure of said producer gas.

7. In the method of heating coke ovens and the like by alternately burning producer gas or illuminating gas in the same, continuously admitting during the period of burning illuminating gas a quantity of primary air to the producers just sufficient to generate such quantity of producer gas as is necessary to maintain the high temperature of the producer and mixing said relatively small proportion of generated producer gas with the illuminating gas before their entrance into the coking oven.

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

RUDOLF GEIPERT.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.