T. VON BAUER.

COKE OVEN.

APPLICATION FILED FEB. 24, 1910.

1,028,087.

Patented May 28, 1912.

3 SHEETS—SHEET 1.

Fig. 1.

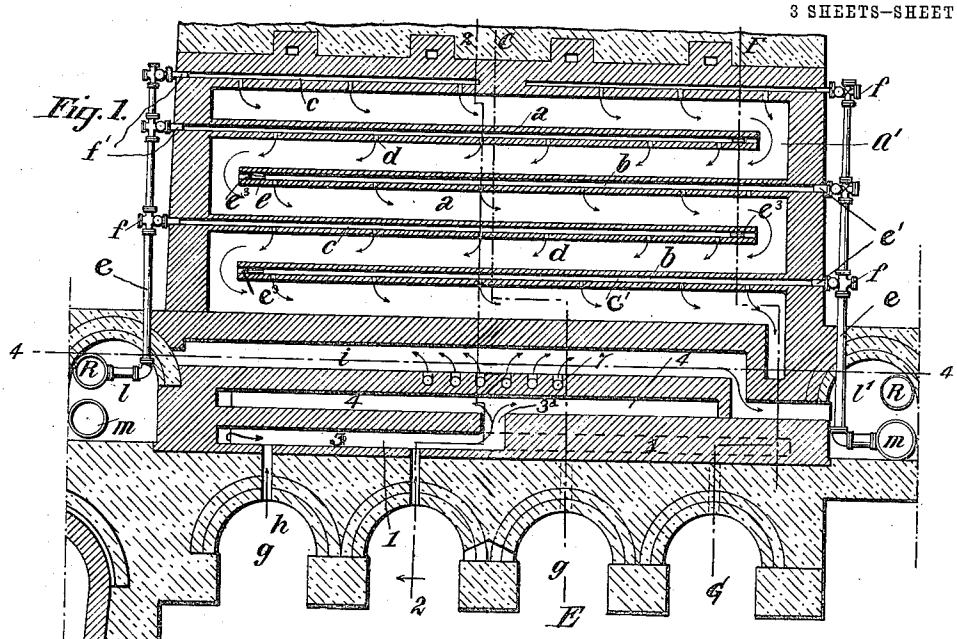
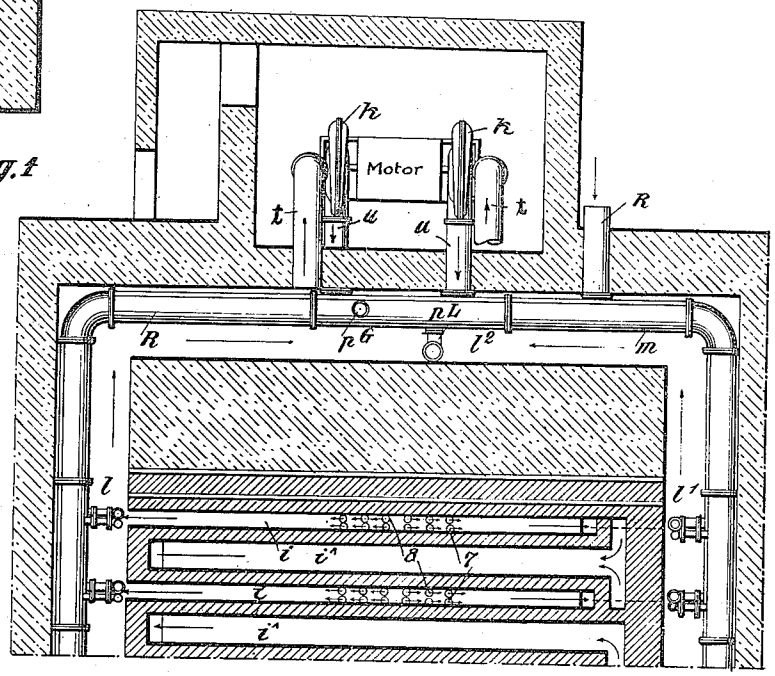


Fig. 4



Witnesses:

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3 SHEETS—SHEET 2.

Fig. 2

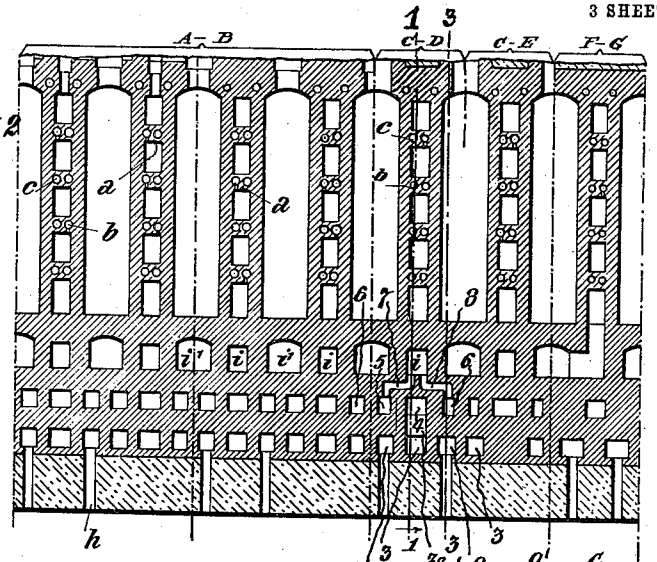
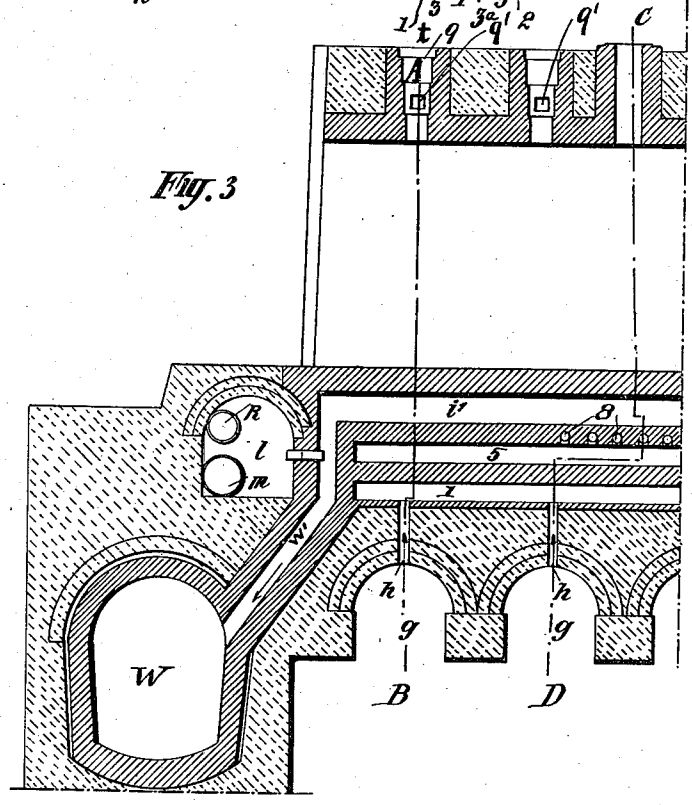


Fig. 3



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3 SHEETS—SHEET 3.

Fig. 5

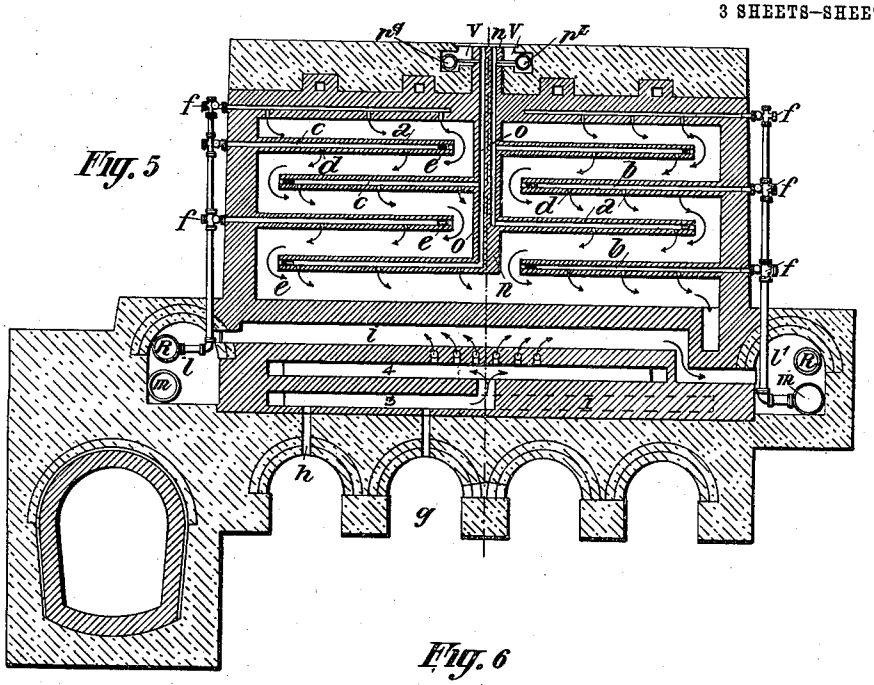
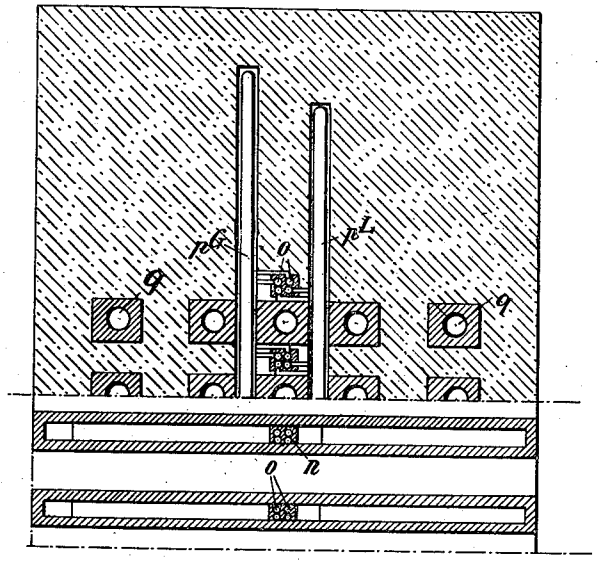


Fig. 6



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UNITED STATES PATENT OFFICE.

THEODOR von BAUER, OF BERLIN, GERMANY.

COKE-OVEN.

1,028,087. Specification of Letters Patent. Patented May 28, 1912.

Application filed February 24, 1910. Serial No. 545,649.

To all whom it may concern:

Be it known that I, THEODOR VON BAUER, subject of the King of Bavaria, residing at 208 Hohenzollerndamm, Berlin, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements in Coke-Ovens, of which the following is a full, clear, and exact description.

In coke ovens with appliances for the recovery of the by-products it has been observed that the distillation gases are decomposed and lose in quality if in rising to the uptake they come in contact with parts at a temperature higher than that at which they were evolved.

The present invention relates to horizontal flue coke ovens wherein this disadvantage is obviated by distributing the temperature so that the degree of heating steadily increases from the crown down to the floor of the oven. This result is obtained by continuous introduction of fresh gas and air at different levels. Heating flues or spaces, arranged in the separating walls of the oven chambers, are divided by partitions to form continuous sinuous passages into which continuous supplies of gas and air are introduced at intervals along their entire course down to the floor of the oven. This principle of heating to a degree increasing in a downward direction has been adopted in ovens previously designed by me.

The object of my present invention is to improve on this principle by providing means whereby the individual supplies of air and gas are themselves heated to different temperatures according to the different levels at which they are to be introduced. That is to say I aim at arranging that the air and gas introduced at the top of the combustion flue are less heated than the air and gas introduced into the flue at lower levels, the temperature of the introduced air and gas to rise to a maximum at the lowest place of introduction.

In the operation of the oven, the efficient preliminary heating of the air and gas supply is of great importance. For this purpose heated air is drawn by means of fans from the bed flues and floor or sole flues through hot air conduits arranged along the entire length of the battery or bank of ovens, and is forced by the same fans through pipes into the heating flues. In a similar manner the heating gases are supplied through separate mains or pipes into which the gas is forced in known manner from the gas-holder. For the purpose of preventing loss of the heat already contained in the air and gas, and of further heating the same, the mains or pipes for the gas and air are arranged within the above-mentioned hot-air conduits extending along the sides of the battery of ovens. An additional great advantage of this heating of the gas is the prevention of the precipitation of the napthalin.

The improved coke-oven is of simple design, cheap in regard to consumption of material, easy to supervise, all regulating devices being arranged above the floor, and it perfectly realizes the hereinbefore defined principle of continuous fresh supplies of gas and air heated to different temperatures according to the places of introduction.

The invention is illustrated in the accompanying drawings, in which:

Figure 1 is a longitudinal section on the line 1—1 of Fig. 2 through one of the heating or combustion flues or chambers of the oven and the bed or foundation with the hot air conduits arranged at the sides; Fig. 2 is a transverse section through the battery of ovens taken on the section lines A—B and C—D Fig. 3, and C—E and F—G Fig. 1; Fig. 3 is a longitudinal section on line 3—3 of Fig. 2 of a part of an oven and its bed or foundation; Fig. 4 is a horizontal section on line 4—4 of Fig. 1 through the sole flues and bed or foundation of a portion of the oven showing the gas and air mains in the hot air conduits and the arrangement of the fans; Fig. 5. is a longitudinal section through the heating flue or chamber of a modified form of oven; Fig. 6 is a horizontal section partly through the roof of the oven and partly through a battery of ovens of the modification illustrated in Fig. 5.

As will be seen from the drawings the heating or combustion flues are formed in the walls separating the oven chambers. Each heating flue is divided by partitions or tongue walls a, which project alternately from opposite walls of the oven and each of which extends almost to the wall opposite that to which it is connected, leaving openings or spaces a' alternately at opposite ends of the heating flue so that a continuous flue

or passage having a sinuous or serpentine course is formed. Each tongue or partition *a* is traversed by two longitudinal ducts or passages *b* and *c*, which are arranged side by side and each provided with a plurality of downwardly directed outlets *d*.

Air is drawn from the foundation vaults *g* of the oven and passes through vertical ducts *h*. As best seen in Fig. 2 some of these ducts *h* lead to horizontal passages 1 and 2 from the ends of which the air flows into intermediate horizontal passages 3 situated between and in the same plane with passages 1 and 2. The passages 3 also have ducts *h* leading into them and from which they receive additional supplies of air, see Fig. 1. From the passages 3 the air flows through openings 3^a into passages 4 arranged above said passages 3. From passages 4 the air divides and flows into passages 5 and 6 arranged at opposite sides and in the same plane with passages 4. The air in each pair of passages 5 and 6 now flows through angular passages 7 and 8 into sole flues *i*, which lie above the passages 4 situated between each pair of passages 5 and 6. In passing through the various passages and sole flues *i* the air is considerably heated by taking heat from the walls of the bed or foundation of the oven, which heat would otherwise have a detrimental effect on said walls. This heat is largely supplied by flues *i'* through which the products of combustion flow from the heating chambers of the ovens to and through the passage W', as indicated by the arrow, into the waste gas main W.

Fans *k* draw the heated air from the sole flues *i* into the hot air conduits *l*, *l'*, and l^2, see Fig. 4, in the foundation brickwork and extending along the battery of ovens. The fans *k*, which are driven by a suitable motor, draw the heated air through pipes *t* and force it through pressure pipes *u* into the mains *m* which are arranged in the hot air conduits *l*, *l'* and connecting conduit l^2 so that no heat is lost by radiation from the main. While I have shown the fans *k* it is ordinarily intended to use only one fan at a time thus having one fan in reserve. From the main *m* the air is forced through vertical stand-pipes *e* and is expelled through the nozzles *e'* which project into the flues *b* within the tongue walls *a*.

The ducts *c*, arranged along side the ducts *b*, serve to supply fresh gas to the heating chambers, which gas flows into them from the gas main R. The gas main R is also arranged within the hot air conduits *l*, *l'* and l^2 and the heated gas by stand-pipes *f* and nozzles *f'* flows into the ducts *c* and *c'* in a manner similar to that of the air supply through the stand-pipes *e* and nozzles *e'* into the ducts *b*. Through the downwardly extending openings *d* in the ducts *b* and *c* the gas and air flow into the heating flues between the oven chambers.

Ducts for gas and air similar to the ducts in the tongue walls are provided in the roof of the oven as shown in Figs. 1 and 2. These ducts are provided with outlets leading into the topmost flue of the heating chamber, as above described.

For preventing or reducing the horizontal outflow of air and gas from the ends of the longitudinal ducts *b* and *c* they may be wholly or partly closed at their ends by plugs or valves e^3. By this means the heating current in the flues receives a continuous supply of air and gas in small quantities so distributed along its length that there is a progressive increase of the temperature from the top to the bottom of the chamber heated by the flues. This result is increased by the fact that in consequence of the progressively furnished additional supplies of air and gas the lower partitions or tongues *a* have higher temperatures than those above them so that when the air and gas flow through the lower partitions they are heated to a higher degree than in the upper partition. All the regulating devices are arranged above the floor which renders them readily accessible.

The nozzles *e'* and *f'* are preferably so arranged that they can also serve as inspection apertures for observing the process of combustion and for easily and conveniently cleaning the passages by means of iron rods. The nozzles are of a shape which allows of directly introducing air in case of accidents to the fans or the like, and each nozzle is independently regulatable. The method of supplying air by means of fans, which draw the air from the bed and floor flues and hot air conduits and force it into the ducts *b* in the partitions or tongues *a* insures accurate regulation inasmuch as both the pressure and quantity of the air supply can be regulated independently of the varying draft of the chimney and the heaters. A further advantage is that in consequence of the draft in the sole flues *i* the air does not tend to penetrate into the oven chambers wherein it would produce detrimental combustion and fusion. For the same reason, and in consequence of the powerful circulation of the heating gases in the heating chambers, no products of combustion can pass from the latter into the oven chambers and there cause deterioration of the quality of the distillation gases.

In the modification illustrated in Figs. 5 and 6 each heating flue or chamber is divided in the center by a vertical depending partition or wall *n*, which extends down to the level of the lowest horizontal partition or tongue *a*, in order to shorten the distance to be traversed by the heating gases and to obtain a more uniform heating along the

entire length of the chamber. As each half of each flue is again sub-divided by the partitions or tongues *a* in the manner hereinbefore described each flue is traversed by two separate heating currents. This renders it possible to make the ovens deeper in the direction of the length of the oven chambers. The gas and air are supplied from mains R and *m* respectively in the same manner as in the construction previously described. In the partition *n* are arranged four longitudinal ducts *o* into which open the ducts *b* and *c* of alternate partitions *a*. The longitudinal ducts *b* and *c* are supplied with air and gas respectively from pipes p^L and p^G connected to the mains *m* and R and arranged in passages *v* in the hot brick-work of the roof close to the partition *n*.

In Fig. 6 the horizontal section through the roof of the oven shows the charging apertures *q* in the brick-work of the roof. As shown in Fig. 2 the charging apertures *q'* see Fig. 2 which communicate with the heating flues. Ordinarily the passages *q'* are closed, but when it is desired to work with gas direct from the oven chambers then the passages *q'* are opened allowing the gas generated in the oven chamber to enter the heating flues.

Except for the differences shown and described as regards the modification illustrated in Figs. 5 and 6 it is substantially the same as the oven shown in Figs. 1, 2, 3 and 4.

I claim:

1. In a horizontal flue coke-oven, heating chambers, tongue walls subdividing said heating chambers and forming a continuous heating flue in a serpentine line, said tongue walls having longitudinal ducts with outlets, and means for supplying air and gas through said longitudinal ducts in the tongue walls into said heating flue to increase the degree of heat in the said heating flue in a downward direction.

2. A coke oven having a plurality of oven chambers, heating chambers between the oven chambers, a plurality of horizontal tongue walls in each heating chamber, the adjacent tongue walls extending from opposite ends of the heating chamber, so as to provide a continuous serpentine heating flue, and means for supplying air and gas to the heating flue through longitudinal ducts in said tongue walls.

3. In a horizontal flue coke-oven, heating chambers, tongue walls subdividing said heating chambers and forming a continuous heating flue in a serpentine line, said tongue walls having longitudinal ducts with outlets, means for supplying air and gas through said longitudinal ducts in the tongue walls into said heating flue to increase the degree of heat in the said heating flue in a downward direction, and a vertical transverse partition dividing the said heating chambers into two continuous heating flues in serpentine lines, said partition wall being provided with passages for the supply of air and gas into the tongue walls meeting said partition wall on each side of it.

4. In a horizontal flue coke-oven, heating chambers, a vertical transverse partition dividing the heating chambers in two parts, horizontally superposed tongue walls meeting alternately the said vertical partition and the side walls of the heating chambers and subdividing said heating chambers to form two continuous heating flues in a serpentine line, said tongue walls having longitudinal ducts therein provided with outlets, and means for supplying air and gas to said ducts to increase the degree of heat in the heating flues in a downward direction.

5. A coke oven having a plurality of oven chambers, heating chambers between the oven chambers, a plurality of horizontal tongue walls in each heating chamber, the adjacent tongue walls extending from opposite ends of the heating chamber so as to provide a continuous serpentine heating flue and said tongue walls having longitudinal air and gas ducts extending therethrough, air and gas pipes on the exterior of the oven connected to said ducts, and regulating devices in said pipes.

6. A coke oven having a plurality of oven chambers, heating chambers between the oven chambers, a vertical partition in each heating chamber, horizontal tongue walls extending in opposite directions from said partitions, horizontal tongue walls in each heating chamber extending toward the partition therein from the opposite wall of the chamber in staggered relation to the tongue walls extending from the partition, all of said tongue walls and said partitions having longitudinal ducts for gas and air therein, and means for supplying gas and air to said ducts.

7. In combination, a horizontal flue coke-oven with heating flues containing staggered partitions arranged to produce a sinuous downward passage, said partitions having longitudinal ducts with successive outlets for parallel supplies of gas and air to the stream of gas flowing through said passage, so that the temperature of said gas stream is increased as the stream progresses, with consequent increase of the temperature of said successive outlets and means for supplying gas and air to said ducts.

8. In combination, a horizontal flue coke-oven with heating flues containing staggered partitions arranged to produce a sinuous downward passage, said partitions having longitudinal ducts with successive outlets for parallel supplies of gas and air to the stream of gas flowing through said pas-

sage, so that the temperature of said gas stream is increased as the steam progresses, with consequent increase of the temperature of said successive outlets, a vertical transverse partition in the heating flues, and groups of staggered horizontal partitions on each side of said vertical partition, the latter having gas and air ducts communicating with the ducts in alternate horizontal partitions.

9. In combination, a horizontal flue coke-oven with heating flues containing staggered partitions arranged to produce a sinuous downward passage, said partitions having longitudinal ducts with successive outlets for parallel supplies of gas and air to the stream of gas flowing through said passage, so that the temperature of said gas-stream is increased as the stream progresses, with consequent increase of the temperature of said successive outlets, a vertical transverse partition in the heating flues, groups of staggered horizontal partitions on each side of said vertical partition, the latter having gas and air ducts communicating with the ducts in alternate horizontal partitions, and means for carrying gas and air to the ducts in the vertical partition.

In witness whereof, I subscribe my signature, in presence of two witnesses.

THEODOR VON BAUER.

Witnesses:

HENRY HASPER,

WOLDEMAR HAUPT.