(No Model.) 3 Sheets—Sheet 1.

T. BAUER.

COKE OVEN.

No. 406,986. Patented July 16, 1889.

Fig. 1.

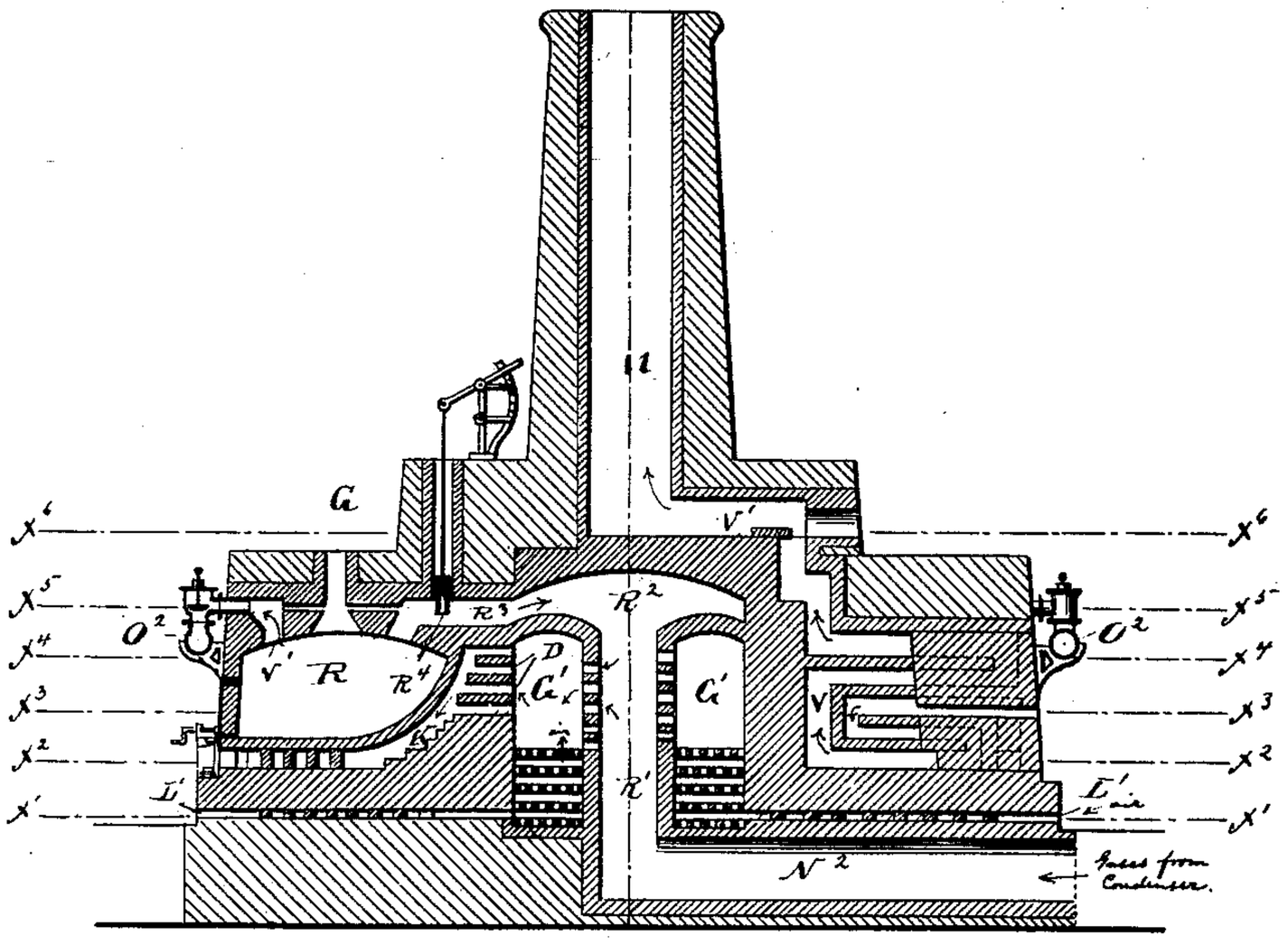
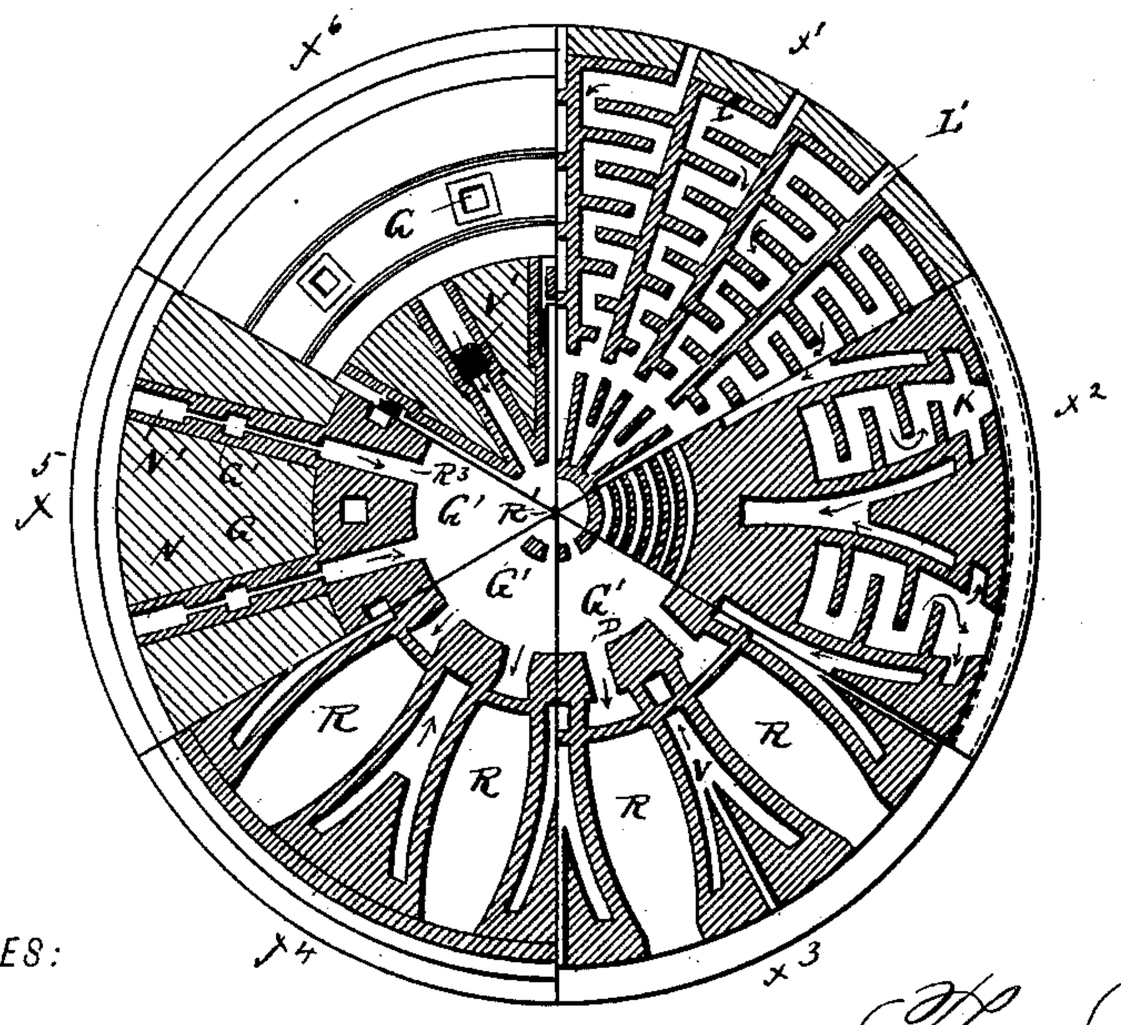


Fig. 2.



WITNESSES:

F. W. Rosenbaum.

Carl Kays

INVENTOR

Theodor Bauer

BY

Joseph Raegener

ATTORNEYS.

(No Model.) 3 Sheets—Sheet 2.

T. BAUER.

COKE OVEN.

No. 406,986. Patented July 16, 1889.

Fig. 3.

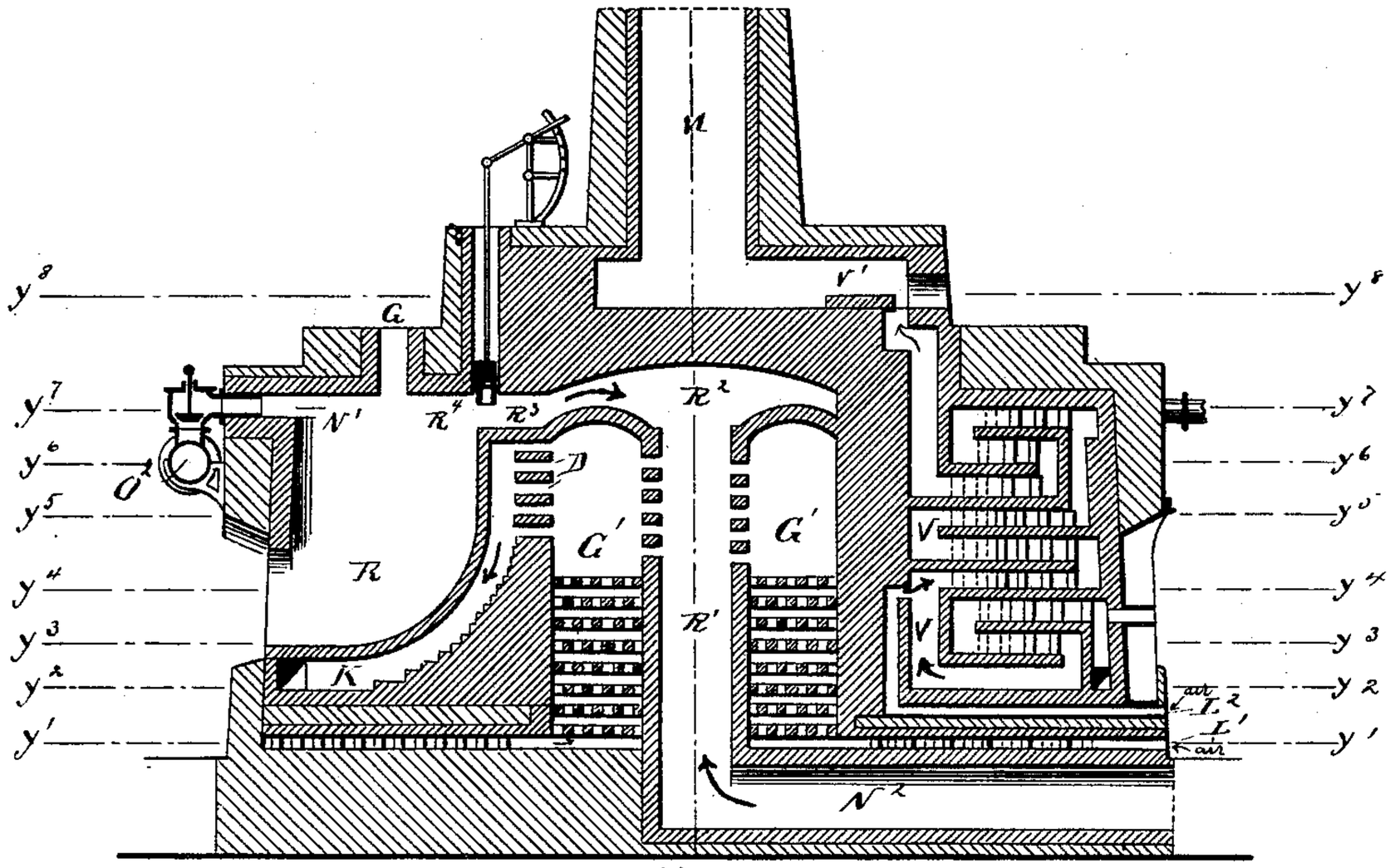
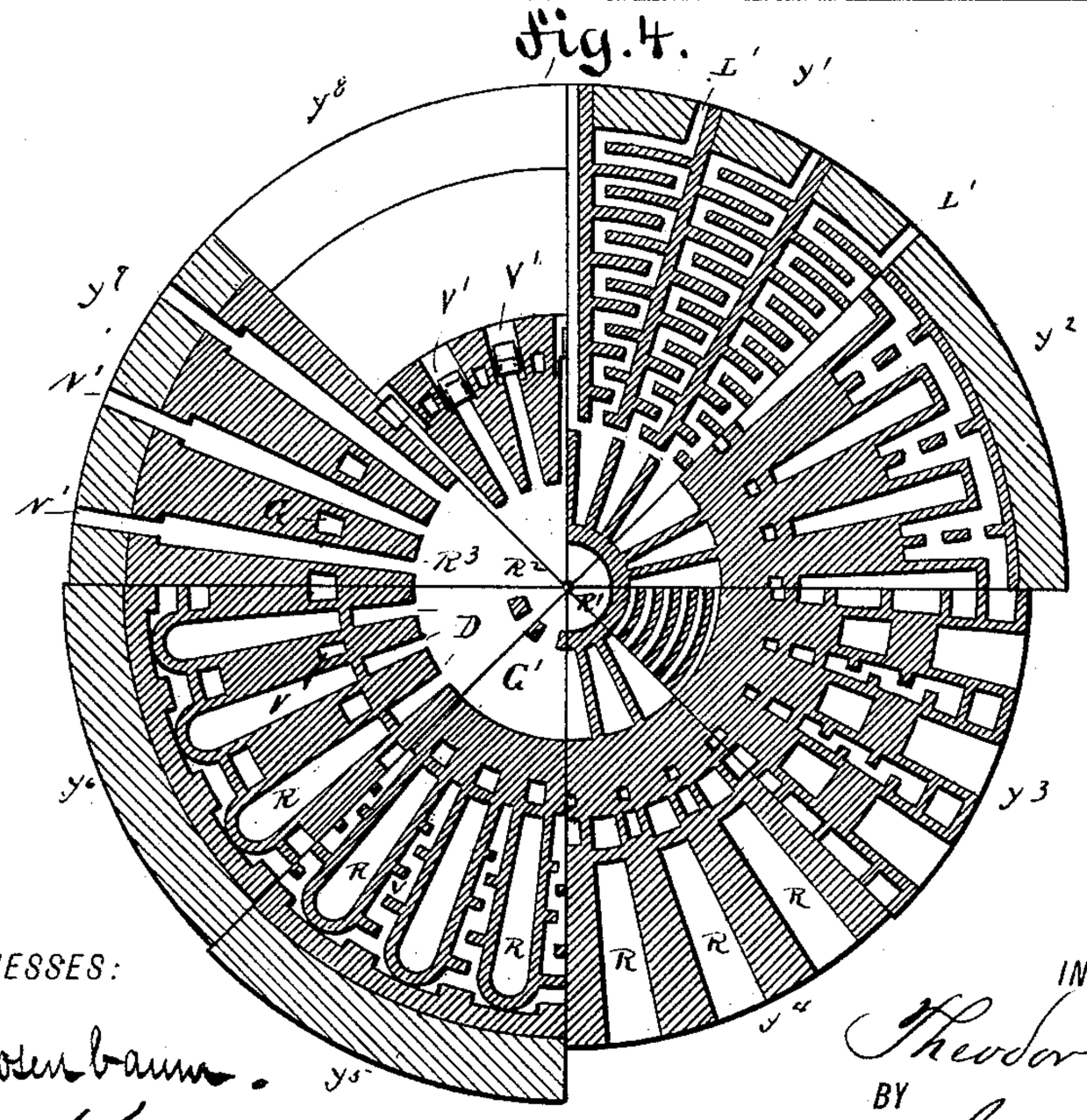


Fig. 4.



WITNESSES:

E. W. Rosenbaum.

Carl Kapp

INVENTOR

Theodor Bauer

BY

Jones & Laegener

ATTORNEYS.

(No Model.) 3 Sheets—Sheet 3.

T. BAUER.

COKE OVEN.

No. 406,986. Patented July 16, 1889.

Fig. 5.

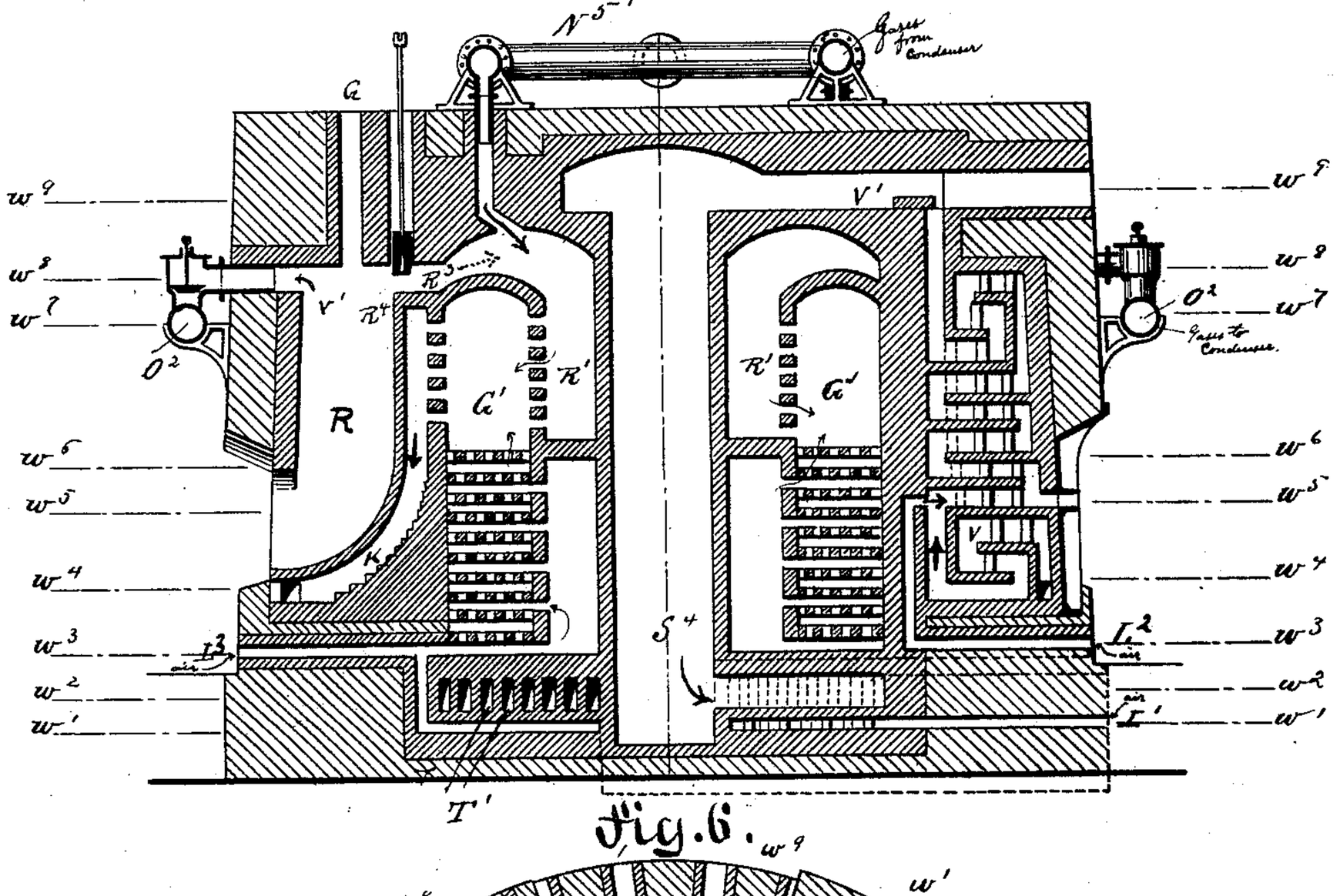
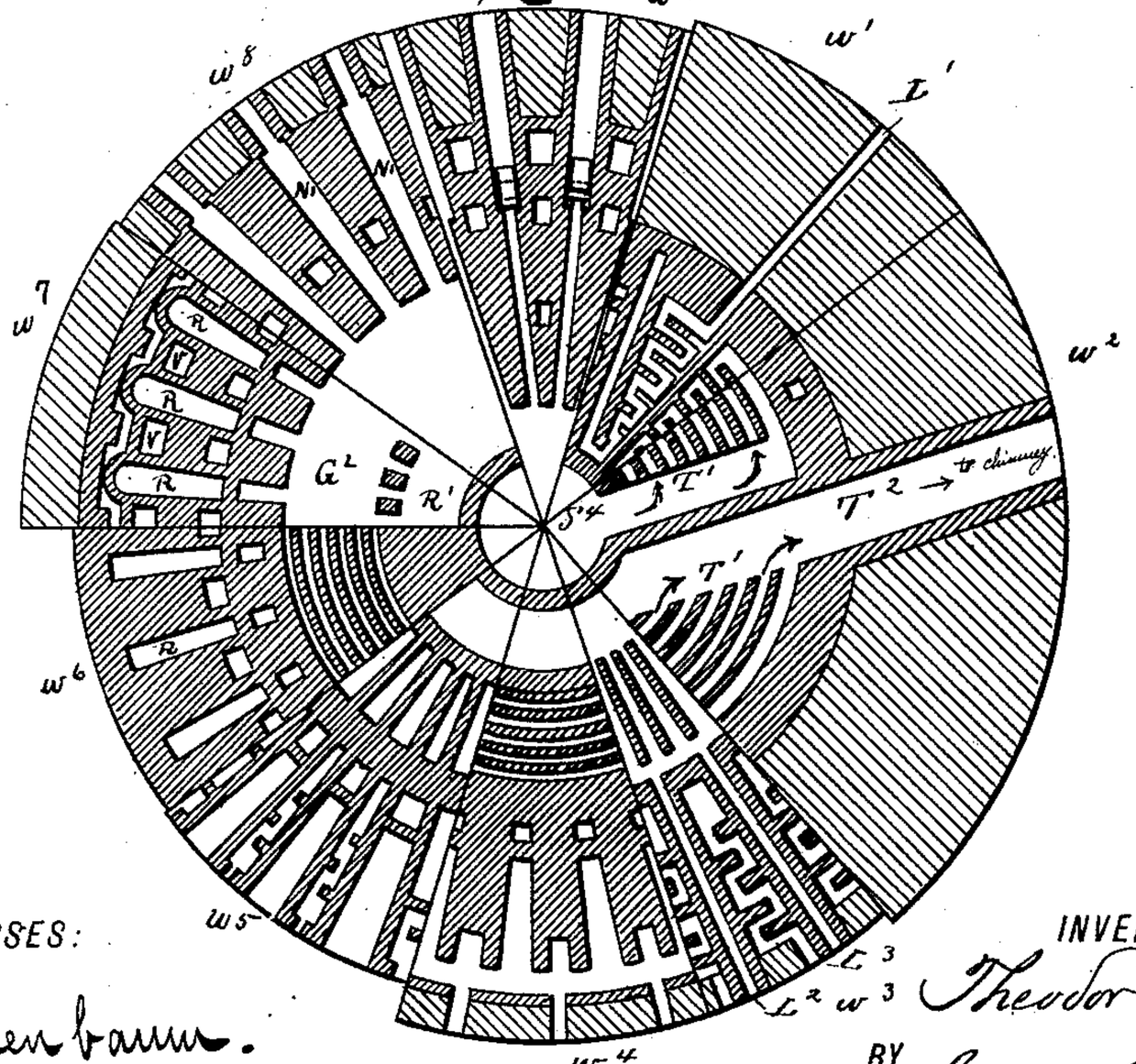


Fig. 6.



WITNESSES:

F. W. Rosenbaum.

Carl Kapp

INVENTOR

Theodor Bauer

BY

Goepel & Raegener

ATTORNEYS.

UNITED STATES PATENT OFFICE.

THEODOR BAUER, OF MUNICH, BAVARIA, GERMANY.

COKE-OVEN.

SPECIFICATION forming part of Letters Patent No. 406,986, dated July 16, 1889.

Application filed August 2, 1887. Serial No. 245,925. (No model.)

To all whom it may concern:

Be it known that I, THEODOR BAUER, of Munich, Germany, have invented certain new and useful Improvements in Coke-Ovens, of which the following is a specification.

This invention relates to improvements in coke-furnaces in which coal of different degrees of quality or grades can be converted into coke, and which furnace can also be used for the purpose of obtaining by-products, such as coal-tar and ammonia, at any time when desired from said coal.

The invention consists, essentially, in a series of coke-retorts grouped around a central gas-conduit, into which some of the gases from the retorts can pass, said chamber being in connection with a combustion-chamber, from which the heated gas and air can pass through channels below and around the retorts, whereby all the retorts are heated uniformly.

The invention also consists in the construction and combination of parts and details, as will be fully described and set forth hereinafter, and then pointed out in the claims.

In the accompanying drawings, Figure 1 is a double cross-sectional elevation of that construction of my improved coke-furnace for rich bituminous coal, the left-hand half being through one of the retorts and the right-hand half through the channels between the retorts. Fig. 2 is a horizontal sectional view of the construction of my improved coke-furnace shown in Fig. 1, the section showing the furnace in six different horizontal planes on the lines $x'\ x'$, $x^2\ x^2$, $x^3\ x^3$, $x^4\ x^4$, $x^5\ x^5$, $x^6\ x^6$, respectively, of Fig. 1. Fig. 3 is a cross-sectional view of that construction of my improved coke-furnace adapted for semi-bituminous coal, the left-hand half of the section being through the retorts and the right-hand half of the section through the channels between the retorts. Fig. 4 is a horizontal sectional view of my improved coke-furnace shown in Fig. 3, said section being shown in eight horizontal planes on lines $y'\ y'$, $y^2\ y^2$, $y^3\ y^3$, $y^4\ y^4$, $y^5\ y^5$, $y^6\ y^6$, $y^7\ y^7$, $y^8\ y^8$, respectively, of Fig. 3. Fig. 5 is a cross-sectional view of that construction of my improved coke-furnace adapted for coal containing but little bitumen, the left-hand half of the section being through one of the retorts and the right-hand half of the section through the channels between the retorts. Fig. 6 is a horizontal sectional view of the construction shown in Fig. 5, the sections being on nine different planes on lines $w'\ w'$, $w^2\ w^2$, $w^3\ w^3$, $w^4\ w^4$, $w^5\ w^5$, $w^6\ w^6$, $w^7\ w^7$, $w^8\ w^8$, $w^9\ w^9$, respectively, of Fig. 5.

Similar letters of reference indicate corresponding parts.

The retorts R are arranged radially around a center, and are all contained within one common structure, from the middle of which the stack or chimney M projects upward. The said retorts are each provided with a top opening G, through which the coal can be passed into them, and in front of said opening G the tops of the retorts are connected by pipes N′ with an accumulating-pipe O^2, extending around the structure on the outside and serving to receive the products of distillation—such as coal-tar, ammonia, &c.—from which pipe O^2 said products of distillation are exhausted into a suitable condenser, from which the surplus gases are conducted through a channel N^2 to a central upwardly-projecting tubular part R′ of the gas-receiving conduit R^2, which is connected by ducts R^3 with the several retorts R, which ducts R^3 can be closed by means of gates R^4, operated by suitable levers on the top of the structure. The ducts R^3 serve to conduct the gases expelled from the coal, after the production of by-products has ceased, into the upper part of the gas-conduit. During the production of by-products the gates R^4 are lowered to close the ducts R^3 and prevent the gases from passing through the said ducts into the gas-conduit.

The gas-receiving conduit R′ is surrounded by an annular combustion-chamber G′, having a series of perforated horizontal partitions, the sides of the conduit R′ being perforated to permit the gases to pass into the combustion-chamber G′. The chamber G′ is connected by a series of ducts D with the space or channels K below the retorts R, so as to permit the hot gases to pass under the retorts and to circulate through the channels V between the retorts, which channels V are shown in the right-hand side of Fig. 1, and have their upper ends in communication with the chimney or stack M. The upper end of each channel V, of which there is one for each retort, can be closed by means of a sliding gate

V′. (Shown in the right-hand side, Fig. 1, and also shown in section x^6 x^6, Fig. 2.)

L′ represents a series of zigzag horizontal channels some distance below the bottoms of the retorts, said channels serving for conveying air from the outside of the furnace structure to the bottom parts of the combustion-chamber G′.

The first sector-shaped part x' of the horizontal section shows the arrangement of the channels L′ below the retorts. The second sector-shaped section x^2 shows the channels K below the retorts. The third sector-shaped part x^3 shows the retorts and the ducts D D, connecting the chamber G′ with the channels K below the retorts. The fourth sector-shaped part x^4 of the section shows the retorts. The fifth sector-shaped part x^5 of the section shows the outlet-channels N′ and the chutes or inlets G for the coal, and, finally, the last part x^6 x^6 of the section shows the chutes G and the arrangement of the sliding valves V′.

In the construction shown in Figs. 3 and 4 the retort is of a slightly-different shape and additional air-inlets L^2 are provided. In this case the air passes through the ordinary inlets in the bottom of the furnace and mixes with the gases in the combustion-chamber G′, and said mixture of air and gas passes under the retorts and up in the channels V between them, and into said channels V air is conducted through the channel L^2, as shown in the right-hand side of Fig. 3.

In the construction shown in Figs. 5 and 6 the gases that have heated the retorts do not pass off into the smoke-stack of the furnace, but are conducted into a central shaft S^4 and through a channel to a smoke-stack located at some distance from the furnace, and which may be used for a number of furnaces, or the gases may be conducted through the flues of a boiler. In this construction the air-inlets L′ and L^2 are provided, and also the additional air-inlets L^3, which will be more fully described later on.

It is evident that my improved furnace can be so adjusted as to produce the by-products mentioned, and in that case the return-gases from the condenser passing through the channel N^2 can be used for heating the retorts, or a mixture of gases passing out of the retorts and of the return-gases with the air can be used for heating the retorts. Experience has proved that that period of the coking process which is most advantageous for obtaining by-products precedes the less advantageous steps; and it is thus evident in my improved furnace that during the time in which the production of the by-products is most advantageous the furnace can be so adjusted as to produce these by-products, (coal-tar and ammonia,) and later on the furnace can be so adjusted as not to produce such by-products, thus doing away with the necessity of the expensive double apparatus which has heretofore been necessary. I am also able to use poor or scant coal, and even mixtures containing fifty per cent. of anthracite and fifty per cent. bituminous coal can be worked economically—that is, to produce a sufficient quantity of coal-tar and ammonia to cover the costs of working the coal. Such mixtures could not be worked advantageously heretofore, as good coke could not be produced, and the production of the by-products was entirely out of the question.

It is a well-known fact that immediately after charging the retorts with fresh coal a great quantity of gas is produced, which the ordinary channels in the old-style coke-furnaces cannot hold, and that these gases cannot be consumed completely, as they cause the clogging of the channels, if only temporarily, and thus the gas and air cannot mix properly in the said channels. In consequence a large quantity of carbon is not consumed and is thus apt to clog the walls of the chamber by the deposits of soot and carbon, the result of which is the production of poor coke and waste of much heat. In my improved furnace the surplus gases (in case an exhauster is not used) pass into the gas-conduit R^2, which is of sufficient size to hold large quantities of gases produced suddenly. If a retort is discharged, the heating of said retort is not stopped and no cold air can pass into the retort, for the reason that when the chamber is to be discharged the corresponding valve R^4 will be closed. No other openings are provided through which the air can enter, the outlet-opening being closed sufficiently by the coke sliding down the inclined bottom of the retort.

I now call attention to a few variations in the circulation of the gases in the three constructions. The circulation of the gases from the chamber G′ to the channels K below the retorts is the same in all constructions. As stated before, the gases pass from the upper end of the retorts down through the channels K, then separate at their lowest points nearest the doors and circulate between the retorts, and then pass through the openings controlled by the valves V′ into the chimney; or in the construction shown in Figs. 5 and 6 they pass through the channel S^4, connected with the chimney or boilers.

The furnace shown in Figs. 1 and 2 has only the air-conducting pipes L′, as the gases do not pass through such long channels in the construction, and the coals used in this construction cake considerably and produce much gas.

In the construction shown in Figs. 3 and 4 the air-conductors L′ conduct the air into the chamber G′ and the air-conductors L^2 conduct the air into the circulating-channels for the gases.

In the construction shown in Figs. 5 and 6 additional air-ducts L^3 are provided, which serve to conduct air into the combustion-chamber. Said ducts, L^3 (shown in the left-hand side of Fig. 5) are arranged circularly, and are above and below a series of circular

ducts T′, connected at their opposite ends with the lower part of the shaft S^4 and with the channel T^2, respectively, so that the spent gases—that is, the gases that have circulated through the channels V′ and pass through the shaft S^4—must circulate through the channels T′ in order to pass through the channels T^2 to the chimney or boilers, and in circulating through the channels T′ said gases heat the air circulating through the channel L^3.

In the construction shown in Figs. 1, 2, 3, and 4 the return gases from the condenser pass into the furnace through the channel N^2 from the bottom; but in the construction shown in Figs. 5 and 6 they are conducted into an annular pipe N^5 on the top of the furnace, and pass through top openings into the combustion-chamber. In this construction, Figs. 5 and 6, but few openings for the entrance of the return gases are necessary, as said return gases are distributed in the chamber G′ and are thoroughly mixed with the air and other gases.

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

1. A coke-oven having a series of radial retorts connected by flues with a central annular combustion-chamber having air and gas ports, substantially as set forth.

2. A coke-oven having a series of retorts arranged radially around and connected by flues with a central annular combustion-chamber, and a central gas conduit or flue for conveying gases to said annular combustion-chamber, substantially as set forth.

3. A coke-oven having a series of radial retorts connected by ducts with a central gas-conduit, said gas-conduit being surrounded by an annular combustion-chamber having air and gas ports, and which annular combustion-chamber is connected with the central conduit by said gas-ports, substantially as set forth.

4. A coke-oven having a series of radial retorts, a central gas-conduit with which said retorts are connected by ducts, an annular combustion-chamber provided with air-induction flues and surrounding the conduit and in communication with gas-combustion channels below and between the several retorts, and flues connecting the central conduit and the annular combustion-chamber, substantially as set forth.

5. A coke-oven having a series of radial retorts connected by ducts with a central gas-conduit, an annular combustion-chamber provided with air-induction flues and surrounding the gas-conduit, gas-combustion channels below and between the retorts, which channels are in communication with the combustion-chamber, a chimney which is in communication with the channels below and between the retorts, and flues connecting the central conduit and the annular combustion-chamber, substantially as set forth.

6. A coke-oven having a series of radial retorts connected by ducts with a central conduit, a combustion-chamber surrounding the gas-conduit, channels extending from the combustion-chamber under and around the bottoms and sides of the retorts, channels for conducting air into the combustion-chamber, additional channels for conducting air into the gas-channels between and below the retorts, and flues connecting the central conduit and the annular combustion-chamber, substantially as set forth.

7. A coke-oven having a series of radial retorts connected by ducts with a central gas-conduit, an annular combustion-chamber provided with air-induction flues and surrounding said gas-conduit, flues connecting the central conduit and the annular combustion-chamber, and a central exit-pipe within the gas-conduit having its lower end connected with a series of gas-outlet channels which are so arranged vertically between two series of horizontal air-inlet channels that the air passing through said air-inlet channels is heated by spent gases passing out of said vertical pipe, substantially as set forth.

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

THEODOR BAUER.

Witnesses:
EMIL HENZEL,
EDWARD W. MEALEY.