

2. Sheets—Sheet 1.

No. 421,583.

Patented Feb. 18, 1890.



Wm R. Webster
Joshua M. Mack, Jr.

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(No Model.)

2 Sheets—Sheet 2.

I. N. KNAPP.
COKE OVEN.

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Fig. 4.

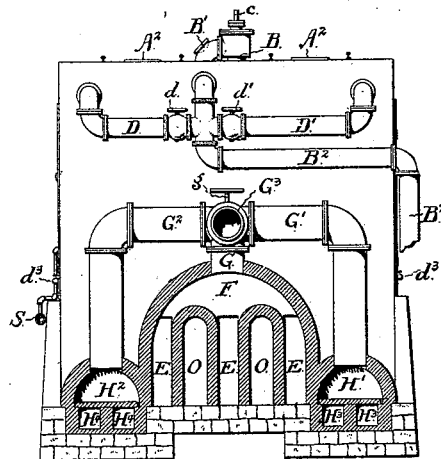


Fig. 5.

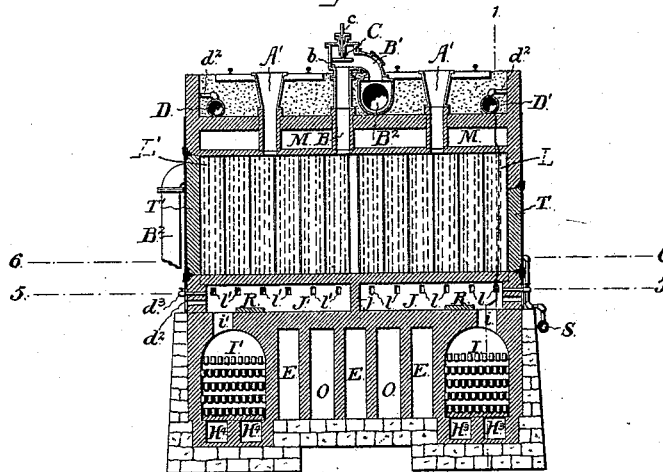


Fig. 6.

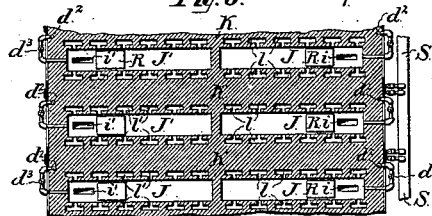
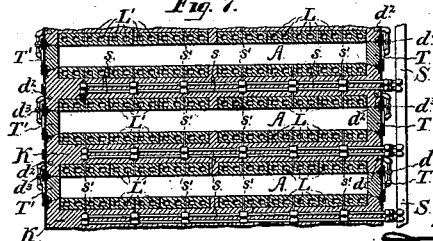


Fig. 7.



WITNESSES:

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UNITED STATES PATENT OFFICE.

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COKE-OVEN.

SPECIFICATION forming part of Letters Patent No. 421,583, dated February 18, 1890.

Application filed June 13, 1888. Serial No. 276,973. (No model.)

To all whom it may concern:

Be it known that I, ISAAC N. KNAPP, of Paterson, county of Passaic, State of New Jersey, have invented a new and useful Improved Coke-Oven, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part of this specification.

My invention relates to the construction of coke-ovens, and has for its object to increase the ease and cheapness with which coke can be manufactured and to save the surplus gases driven off from the coal during its distillation.

The nature of my invention will be better understood after an examination of the drawings forming a part of this specification, in which—

Figure 1 is a plan view of my improved coke-oven; Fig. 2, an elevation thereof taken on the section-line 1 1 of Figs. 1 and 3. Fig. 3 is a plan view on the section-line 2 2 of Fig. 2. Fig. 4 is an end elevation on the section-line 3 3 of Figs. 2 and 3. Fig. 5 is an end elevation on the section-line 4 4 of Fig. 2. Fig. 6 is a plan view of a portion of my improved coke-oven on the line 5 5 of Fig. 5, and Fig. 7 is a similar view on the line 6 6 of Fig. 5.

A A, &c., indicate the individual coking-ovens, which may be combined together, as shown, in any desired number. The ovens A are what is known as vertical closed ovens, their sides being quite close together, as is shown. These ovens are provided with doors T and T' in their front and back ends and the manufactured coke is pushed out of them by means of a ram, this part of the apparatus being well understood by engineers familiar with this kind of oven. The coal to be coked is introduced into the ovens A through the coal-holes A', which, when not in use for filling the ovens, are closed by lids, as is indicated at A², Fig. 4.

It will be most convenient to describe the different parts of my improved oven by following the course of the air and gases, by the combustion of which it is kept in operation. To begin with, therefore, in starting the ovens it is necessary, in order to dry the masonry and begin the distillation of gas, to build a fire in the ovens A, leaving the doors

T or T' open to supply air and the coal-hole A' open to permit the escape of the products of combustion. When this combustion is continued long enough to dry the masonry and to store sufficient heat to insure the distillation of sufficient coal to fill the mains, &c., the doors T T' and the coal-holes A' are closed and the regular operation of the ovens then begins. The gases generated in the chambers A then pass into the conduit marked B in the drawings, and from this conduit into conduit B' leading to a main marked B². The sealing of the conduit B is accomplished by forming in it a valve-seat marked b and providing a valve C with a stem c, extending outside of the conduit, by means of which the valve C can be seated on the valve-seat b and the connection between the main B² and the conduit B cut off at will. The valve C can be arranged to seat itself by its own weight, thus becoming automatic, the gas raising it when there is sufficient pressure in the oven A, and the valve falling back to the seat whenever the pressure in main B² exceeds that in the oven. The main B², connecting with all of the ovens in the structure, runs along the top, as shown, and leads finally to a holder. (Not shown in the drawings.)

D and D' are gas-pipes connecting with the main B², as is shown in Fig. 4, and each having a stop-cock d and d', by which the flow of gas can be shut off at will in either one of them. These pipes D and D' extend parallel to the main pipe B, along the bank of ovens, small pipes d² leading from them into combustion-chambers J and J', situated beneath the ovens A. Each of these pipes d² is provided with a regulating-cock d³, by which the supply of gas admitted to the combustion-chambers can be regulated.

The ovens A are built above a regenerative system, as shown in the drawings. In this system, E E E are air-flues into which the air enters at their ends to the left of Figs. 1 and 3, and through which it passes into the air-chamber F. (See Fig. 4.) From the air-chamber F a conduit (marked G) leads to a four-way valve g. Three other conduits G', G², and G³ also lead to this valve, and are connected and disconnected with each other by its means. The pipes or conduits G' and G²,

leading, respectively, to the chambers H' and H^2 , and the pipe G^3 , leading to the chamber N , the valve g being arranged so as to connect the conduits G and G' together, will also connect the conduits G^2 and G^3 together, (or the contrary when its position is changed.) Conduits G and G' being connected, the air passes from the chamber F to the chamber H' , from which it escapes into the two parallel conduits H^3 and H^3 , which run beneath the regenerator I and are connected with it throughout its length by the openings h . (See Fig. 2.) The regenerators I again are connected throughout their length with the combustion-chambers J by means of openings i , these openings being controlled by valves R . The air therefore passes from the parallel conduits H^3 and H^3 through the regenerators I , and through the openings i into the combustion-chambers J . Here it meets with the gas issuing from the small pipes d^2 , and, the temperature being sufficiently high, combustion ensues. The burning gases and products of combustion pass from the combustion-chamber J through the openings l into the flues L L , &c., which said flues form the walls of one end of the ovens A . From the flues L the gases pass into the chambers M at the top of the ovens, and from the chambers M they pass downward through the flues L' L' , &c., which form the walls of the other end of the ovens, through openings l' , into the combustion-chambers J' , from which they escape through openings i' into the regenerators I' , passing through and out at the bottom of which, through openings h , they enter the parallel flues H^4 H^4 and the chamber H^2 , into which these flues lead. From this chamber the gases escape through conduit G^2 , valve g , and conduit G^3 , into the chamber N , and thence through the flues O O , which separate the air-flues E E E , to the stack P , heating the entering air as they escape.

At proper intervals the valve g is moved so as to change the current of the air and gas through the apparatus, the two sides of which are exactly the same, the result of the movement of the valve being to cause the air to pass through the freshly-heated regenerators, while the spent products of combustion pass through the regenerators which have been previously deprived of their heat.

It will be noticed that the chambers J and J' , lying beneath the ovens A , are virtually a single chamber divided into two by a wall j .

It is highly desirable, in order to get the greatest possible amount of useful and valuable gas from the ovens, that steam should be injected into the mass of hot coke at or about the time the coking operation is completed and before the coke is withdrawn from the oven. The steam will be decomposed by its contact with the coke and water-gas formed, which is a valuable addition to the gas-supply. The heat of the coke being thus utilized it will be drawn from the ovens at a lower temperature than would otherwise be the case.

This is accomplished by the plan shown in the drawings, S being a steam-pipe, from which small steam-pipes s lead through the walls K between the ovens A , small branch pipes s' leading from the pipes s into the ovens A , preferably in a great number of points, as shown in Fig. 7, so that the steam will be divided into many jets and brought into contact with the mass of coke in the oven.

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

1. In a stack of coke-ovens, the combination of the ovens A , combustion-chambers J J' , situated below said ovens, chambers M , situated above said ovens, flues L L , &c., connecting the chambers J and J' with chambers M , a gas-main B^2 , connecting with the ovens, conduits D D' , arranged on each side of the stack connecting with the main B^2 , and having independent stop-cocks d d' , a series of pipes leading from conduit D to the chambers J' , a similar series of pipes leading from conduit D' to the chambers J , the regenerators I and I' , connected, respectively, with the chambers J and J' by openings i and i' , chambers H' H^2 , connecting with the regenerators I and I' , an air-chamber, a chamber connected with the stack, conduits leading from the said four chambers to a valve-chamber, and a four-way valve by which the air-chamber can be connected with either of the regenerators and the stack with the other regenerator at will.

2. In a stack of coke-ovens, the combination of the ovens A , combustion-chambers J J' , situated below said ovens, chambers M , situated above said ovens, flues L L , &c., connecting the chambers J and J' with chambers M , a gas-main B^2 , connecting with the ovens, conduits D D' , arranged on each side of the stack connecting with the main B^2 and having independent stop-cocks d d' , a series of pipes leading from conduit D to the chambers J' , a similar series of pipes leading from conduit D' to the chambers J , the regenerators I and I' , connected, respectively, with the chambers J and J' by openings i and i' , conduits passing beneath the regenerators and connected with them throughout their whole length by openings h h , &c., chambers H' H^2 , connected with said conduits, an air-chamber, a chamber connected with the stack, conduits leading from the said four chambers to a valve-chamber, and a four-way valve by which the air-chamber can be connected with either of the regenerators and the stack with the other regenerator at will.

3. In a stack of coke-ovens, the combination of the ovens A , combustion-chambers J J' , situated below said ovens, chambers M , situated above said ovens, flues L L , &c., connecting the chambers J and J' with chambers M , a gas-main B^2 , connecting with the ovens, conduits D D' , arranged on each side of the stack connecting with the main B^2 and having independent stop-cocks d d' , a series of pipes

leading from conduit D to the chambers J', a similar series of pipes leading from conduit D' to the chambers J, the regenerators I and I', connected, respectively, with the chambers J and J' by openings *i* and *i'*, conduits passing beneath the regenerators and connected with them throughout their whole length by openings *h* *h*, &c., chambers H' H², connected with said conduits, an air-chamber, air-flues extending from the air-chamber beneath the bank of retorts and between the regenerators, a chamber adjacent to the air-chamber, flues extending from said chamber between the air-flues to a stack, conduits leading from the air-chamber, the flue-chamber, and the chambers H' H² to a common point, and a four-way valve situated at said point, by moving which the course of the air and gas can be changed at will, all substantially as and for the purpose specified.

4. In a stack of coke-ovens, the combination of the ovens A, combustion-chambers J J', situated below said ovens, chambers M, situated above said ovens, flues L L, &c., con-

necting the chambers J and J' with chambers M, a gas-main B², connecting with the ovens, conduits D D', arranged on each side of the stack connecting with the main B² and having independent stop-cocks *d* *d'*, a series of pipes leading from conduit D to the chambers J', a similar series of pipes leading from conduit D' to the chambers J, the regenerators I and I', connected, respectively, with the chambers J and J' by openings *i* and *i'*, chambers H' H², connecting with the regenerators I and I', an air-chamber, a chamber connected with the stack, conduits leading from the said four chambers to a valve-chamber, a four-way valve by which the air-chamber can be connected with either of the regenerators and the stack with the other regenerator at will, and a steam-pipe having branches extending into each oven and opening therein through numerous orifices.

ISAAC N. KNAPP.

Witnesses:

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