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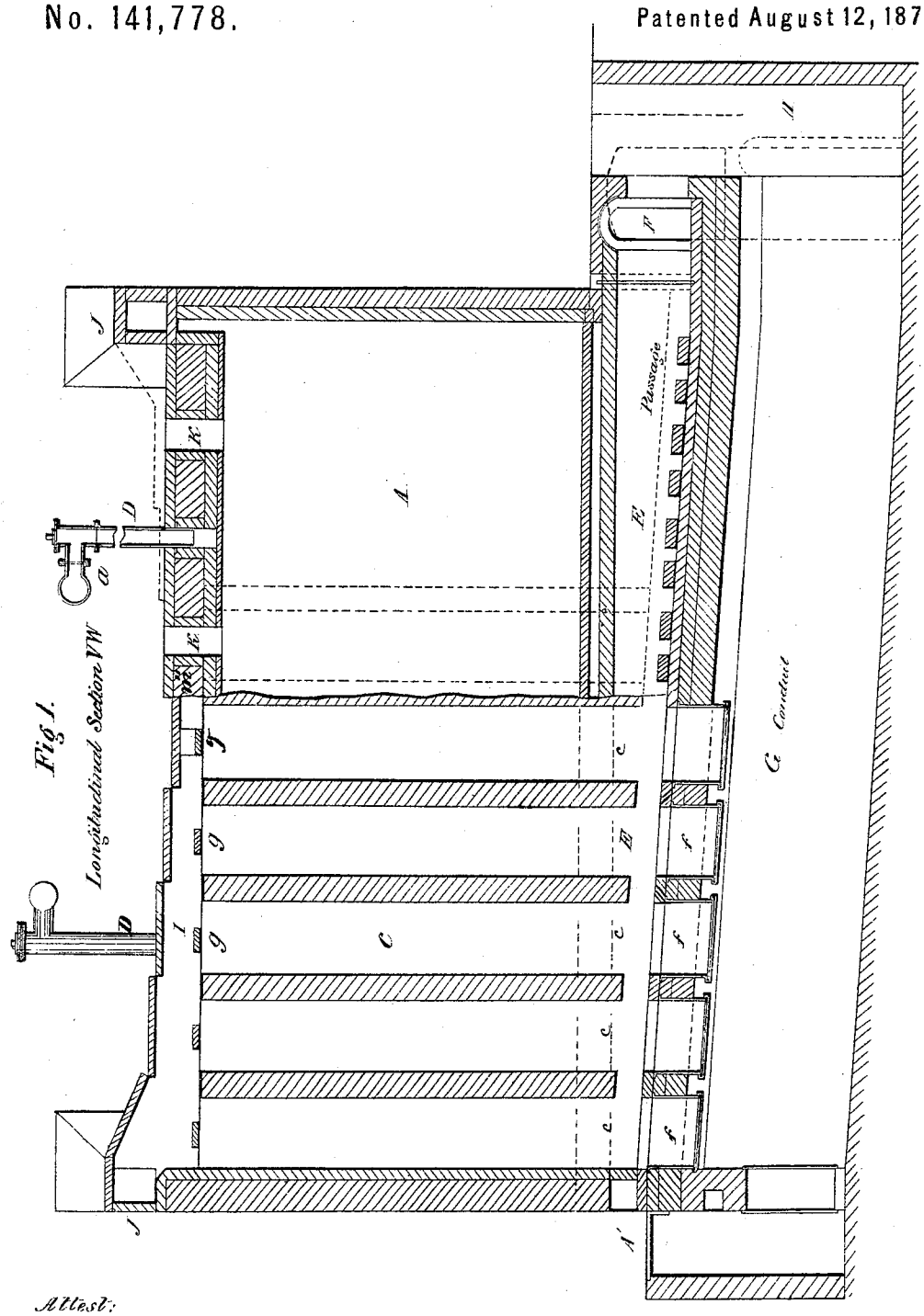
Coking-Furnaces.

No. 141,778. Patented August 12, 1873.



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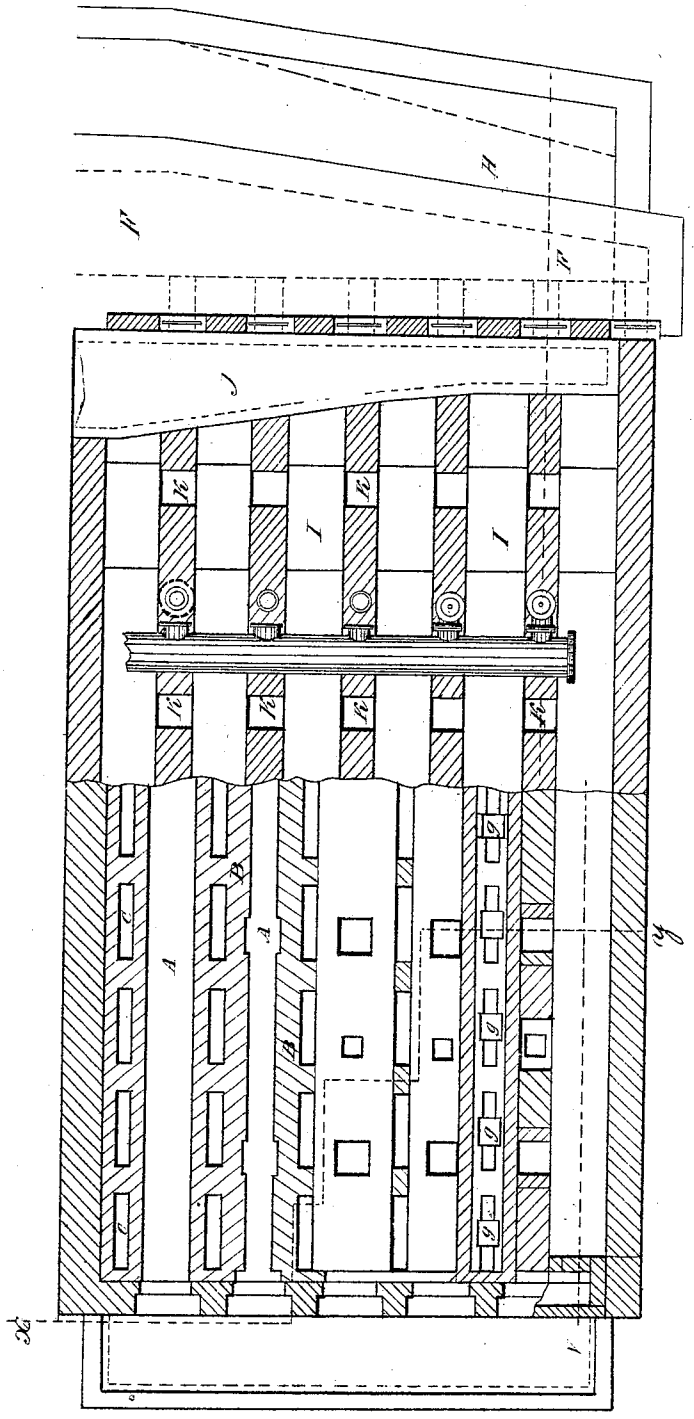

Fig. 2.

Ground Plan.

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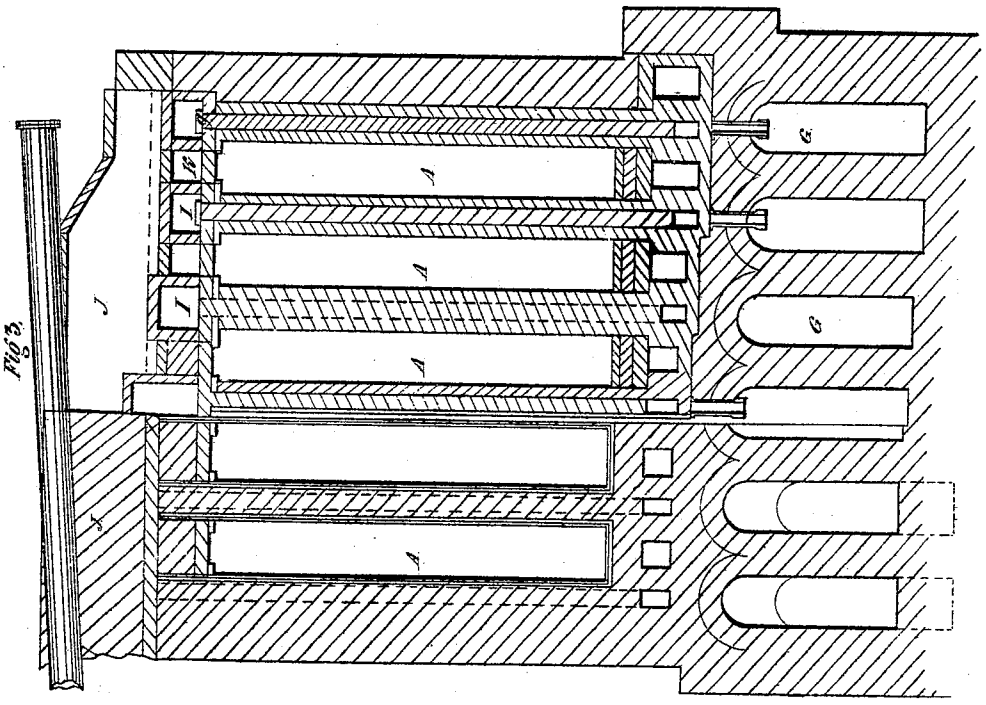
No. 141,778. **Coking-Furnaces.** Patented August 12, 1873.



Transverse Section. Fig 3.

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UNITED STATES PATENT OFFICE.

HENRY ENGELMANN, OF SALT LAKE CITY, UTAH TERRITORY.

IMPROVEMENT IN COKING-FURNACES.

Specification forming part of Letters Patent No. **141,778**, dated August 12, 1873; application filed December 6, 1872.

A.

To all whom it may concern:

Be it known that I, HENRY ENGELMANN, of Salt Lake City, in the Territory of Utah, have invented certain Improvements in Coking-Furnaces, of which the following is a specification:

This invention may be used for coking purposes generally, but is more especially designed for coking imperfectly-caking or non-caking coals, lignite, anthracite waste, and analogous material refractory to ordinary treatment in the common coking-ovens. It consists in a furnace constructed with vertical heating-flues, provided in the walls, between high, narrow, and comparatively long coking-ovens, with horizontal or slightly-inclined floors, in such manner that the ovens can be rapidly, strongly, and uniformly heated throughout by heat radiated laterally from the flues, and which heat is created by the combustion of inflammable gases, which are ignited with the introduction of a suitable quantity of air, either in these vertical flues or immediately before entering these flues, and pass through them, thus ignited, either upward or downward, radiating their heat into the ovens. The invention also consists in the combination of the aforesaid heating-flues with conduits of combustible gas which pass longitudinally along their lower or respectively upper ends and communicate with these flues. The hot products of combustion, on leaving the flues, are taken up by other conduits, also passing longitudinally along their opposite ends, which conduct them to chimneys distributed at suitable points along these conduits, or to a large stack, in which the conduits from a number of ovens unite. The conduits which carry the inflammable gases to the heating-flues in the sides of the ovens connect with separate furnaces for the production of these heating-gases by the imperfect combustion of fuel, so that the heating of the flues and ovens is independent of the evolution of gases by the process of coking inside of the ovens, and can be regulated at will by the operator. Hereby, the admixture of the gases evolved in the coking-ovens by the process of coking to these independently-created gases is by no means excluded. The invention also comprises certain novel means for facilitating the coking of the carbonaceous material placed inside the ovens, and for conducting the requisite quantity of gas and air to the vertical heating-flues in the walls of the ovens, and for regulating the combustion and heat in these heating-flues.

Figure 1 is a vertical longitudinal section of a furnace constructed according to my invention. Fig. 2 is a horizontal section of the same. Fig. 3 is a vertical transverse section of the same taken in the line *x y* of Fig. 2.

The furnace may be constructed of the usual materials—fire-brick for those parts most exposed to the heat, and common brick for the outer or external portions. It comprises any desired number of narrow ovens, A, of great height and length, as compared with their width, arranged side by side, with intervening walls B, through which extend the vertical flues C. As shown more clearly in Fig. 2, these flues are oblong in their cross or horizontal section, with their longest sides parallel with the adjacent sides of the ovens, the flues being thus arranged to secure the most facile and effective radiation of heat therefrom, to, and into the ovens. Each oven should have about the proportions of from twenty to thirty feet in length, from fifteen to twenty inches in width, and from eight to twelve feet in height. The narrow form thus given to the ovens is essential to the rapid action upon the material to be coked of the heat derived from the flues C, as hereinafter more fully set forth. The height given to the ovens is likewise essential for making a compact and firm coke, which otherwise would be soft and lack firmness in consequence of the high heat to which the coal is exposed in the ovens at once after being charged. It is also essential for the more complete decomposition of the carbureted volatile products of the coking process, which are thus prevented from escaping too readily, and are on their way brought more in contact with the heated walls of the ovens, whereby they are decomposed, and their carbon is partly deposited upon the coking mass, whereby a higher percentage of coke and a denser coke are secured. It is, furthermore, essential in securing a better utilization of the heat created by the combustion in the vertical heating-flues C′ in the walls of the ovens. The length of the ovens is less

essential; but it is generally profitable and desirable to make them as long as can be done conveniently.

Each oven is furnished at either end with an opening, closed when the furnace is in operation by fire-brick bound with iron, as shown at A′. At its top each oven is furnished with outlet-pipes D, for carrying off the gases evolved by the coking process, each of which is provided with a valve, *a*, whereby the said pipes may be either wholly or partially closed, as may be desired, and the outflow of the gases may thus be checked or throttled. This arrangement has a similar effect as the height of the ovens. It subjects the coking mass in the oven to pressure, and secures a more complete decarburation of the coking-gases. At its top each oven is further provided with a suitable number of openings for introducing the charge, and which are, during the process of coking, securely closed by means of blocks of fire-brick, K, which are luted. The gases for heating the flues C are generated in an independent and separate furnace of any known or suitable construction for producing inflammable gases from the partial or imperfect combustion of fuel. They are carried to the heating-flues C in the walls of the ovens A by gas-conduits, which, branching from a main conduit, pass longitudinally along the ends of the flues C and connect with them. These gas-conduits, and the air-conduits by which the air for the combustion of the gases is admitted at the proper points, may be arranged in various ways. The gases may be admitted at the upper ends of the heating-flues C, when air may be admitted directly to them at these points by short pipes, and the combustion take place downward in the flues, and the products of combustion or hot gases be taken up by canals running lengthwise along the lower end of the flues C, and thus carried to chimneys; or the gases and air may be admitted at the lower end of the flues C, and the combustion proceed upward, when the spent gases may be gathered from the various flues C in conduits running longitudinally over the partition-walls of the ovens A, which carry them to chimneys distributed suitably over the coking-furnace, or to a chimney common to all the flues and ovens of the furnace. The heat retained by these gaseous products of combustion may be utilized in various ways before they are allowed to escape through this chimney.

The device for distributing gas and air, and carrying off the products of their combustion, illustrated in the annexed figures, and which I also claim as novel, is the following: Provided under each oven is a longitudinal passage, E, with openings *e*, establishing communication with the lower ends of the vertical flues C. These passages connect at one end of the furnace with another or transverse passage, F, common to all the passages E just named, and supplied with combustible gas from an independent gas-producing furnace or other suitable source of supply of gaseous fuel. Underneath each of the passages E is a longitudinal air-conduit, G, communicating by openings *f* with the flues C above, and all in communication with the atmosphere through the well H at one end of the furnace. The size of the openings *f*, for the admission of air into the flues C, can be regulated by more or less opening valves or slides attached to these openings. It will be noticed that the proper distribution of gas to each of the flues C of each longitudinal series is secured, in part, by making the gas-passage E connecting therewith largest at its outermost end, and continuously diminishing in transverse area as the number of flues to be supplied from it decreases, as will be understood by reference to Fig. 1. This arrangement has the further advantage over a conduit of equal or uniform, and therefore at its extreme end unnecessarily wide, cross-section, that it does not contain and expose to the high temperature existing in this canal an unnecessarily large volume of the heating-gases, which would thereby be decomposed and deposit part of their carbon, losing thereby part of their heating power and obstructing the conduit. Each flue C opens at its upper end into a longitudinal outlet-flue, I, the opening being more or less contracted or partially closed by fire-brick placed at *g*, by which means a proper tension of the burning gases is maintained in the heating-flues C, and a uniform distribution of the gases and heat in these flues is effected. At its center, measuring from either end, each outlet-flue I is divided by a transverse partition, *m″*, which causes one portion of the escaping gaseous products of combustion to pass one way to an outlet, J, at one end of the furnace, while the remainder of the said products passes to a similar outlet, also marked J, at the opposite extremity of the apparatus. When, for any reason, (as, in some cases, may occur,) it be desired, the gases may be ignited in the conduit-flues, arranged in such relation with the heating-flues C that a portion of the flame, together with the hot products of combustion, may pass into the flues to heat the ovens in a manner substantially identical with that insured when the combustion occurs wholly in the flues; but the ovens can then not be made quite so long; otherwise the heat would not be quite so uniform in their different parts.

In using the furnace, the ovens are first brought to the proper heat by admitting the gases from the conduits F and the air from the passages G together to the flues C, and firing them. A rapid combustion is maintained to secure the high temperature required. The openings at the ends of the ovens are securely closed, and when the ovens have attained the proper temperature the charge is introduced into the ovens through the openings in the top thereof, which are then tightly closed by the fire-brick blocks K. The proper heat is then maintained as long

as may be necessary, and regulated according to the requirements of the process, until the charge is thoroughly coked. The pressure upon the coking mass, due to the evolution of gases from the coking mass, may be regulated at will by adjusting the valves *a* in the pipes D. When the process is completed, the coke is removed from the ovens through the openings A′, in the same manner as from other long horizontal coking-ovens.

The high initial and sustained heat, due to the arrangement of the heating-flues C and the use of an independent source of heating-gases, and the pressure consequent upon the height of the charge in the ovens and to the tension of the escaping gases, maintained by means of the valves *a* in the pipes D, not only effects a perfect coking of materials, which cake imperfectly in ordinary furnaces, but also makes it possible to coke non-caking materials, commonly so called, and of which lignite or anthracite may be taken as examples, if mingled with variable proportions of caking bituminous coal or coal-tar, asphaltum, or the like, which proportion of admixture is much smaller than would be required for effecting the same result in coking-ovens of other known construction. Furthermore, the process is so rapidly completed as to permit, with economy, a certain cooling of the coke in the ovens previous to withdrawal. Thus, a too profuse application of cold water for cooling the hot coke may be avoided, which otherwise splits and disintegrates coke naturally lacking in firmness, and diminishes its value as furnace fuel.

Apart from the combinations herein shown and described, I do not claim any part of the subject-matter embraced in the patent of W. G. Valentine, granted January 13, 1863; but

What I claim as my invention is—

1. The peculiar shape of the coking-ovens A, combining small width and great height with considerable length, as specified.

2. The combination, with the narrow and high ovens A, of the vertical heating-flues C, provided in the walls between these ovens, constituting, in fact, as many different heating-furnaces, substantially as and for the purpose specified.

3. The combination, with the narrow, high, and long ovens A, heated in the specified manner, of a valve or equivalent means of throttling or stopping the outflow of gases from the material subjected to coking, whereby the retention of the gases long enough to secure the most efficient deposition of carbon therefrom is provided for, substantially as herein described.

4. The arrangement, with reference to the heating-flues C in the intervening walls of the coking-ovens A, of the openings C of the gas-passages E, and the openings *f* of the air-conduits G, substantially as and for the purpose specified.

5. The arrangement, with reference to the vertical heating-flues C provided in the walls B of the coking-ovens A, of the outlet-flues I and the outlets J, the outlet-flues being divided centrally at *m″*, and the outlets provided at opposite ends of the furnace, substantially as and for the purpose herein set forth.

HENRY ENGELMANN.

Witnesses:
S. J. JONASSON,
JAMES LOWE.