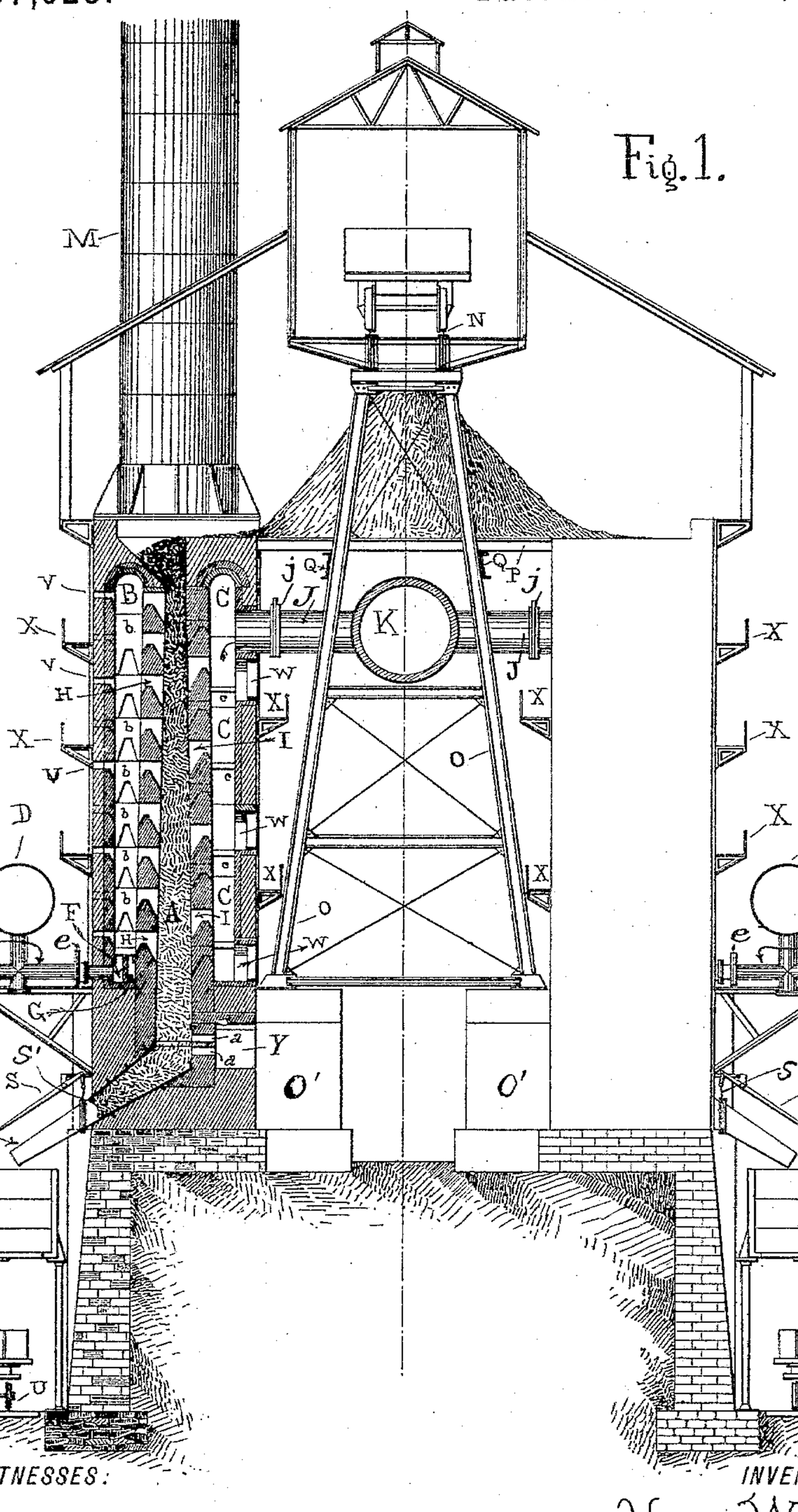
(No Model.) 3 Sheets—Sheet 1.

H. WEHRUM.

ORE ROASTING FURNACE.

No. 597,628. Patented Jan. 18, 1898.

Fig. 1.



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(No Model.) 3 Sheets—Sheet 2.

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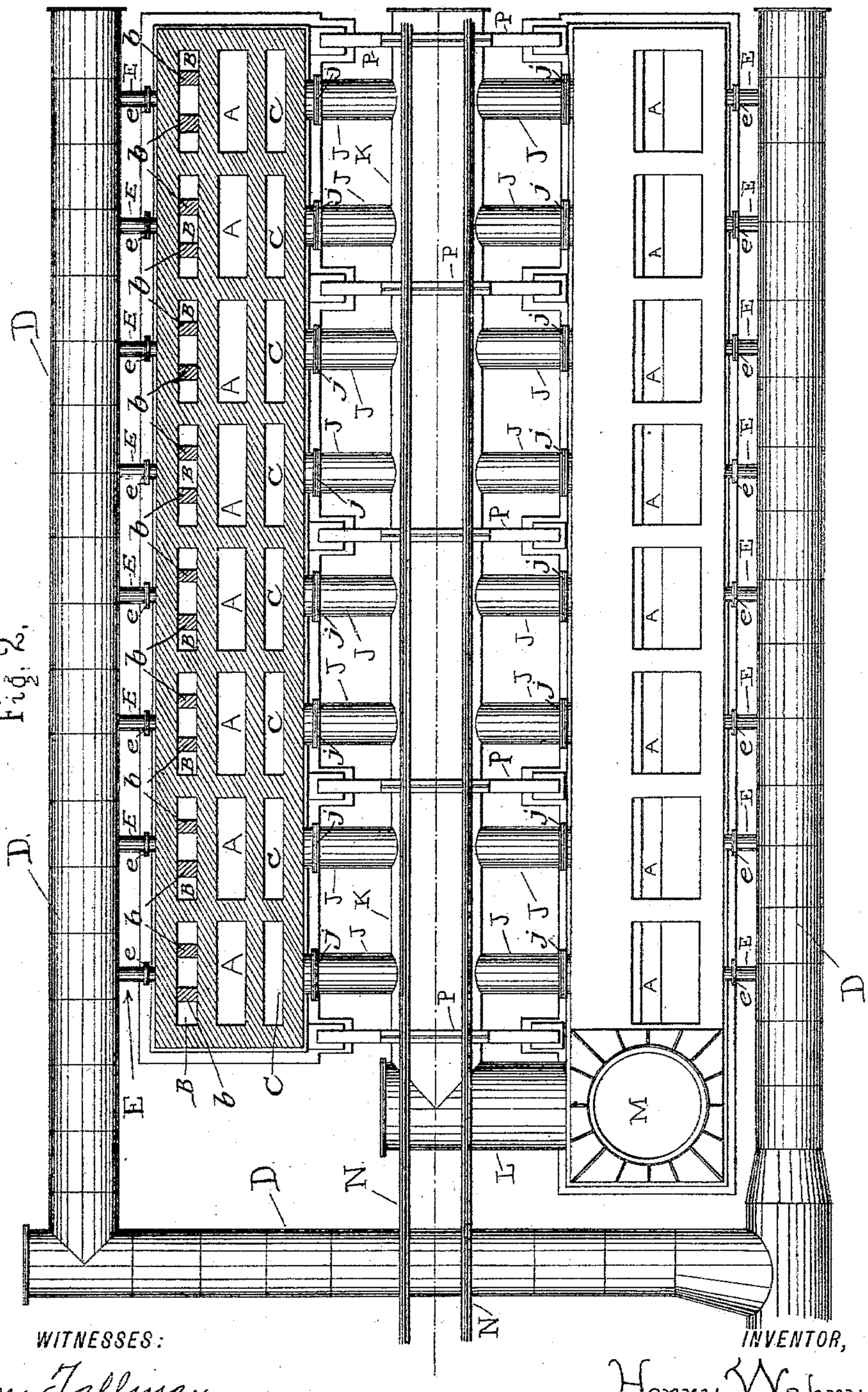
Fig. 2.



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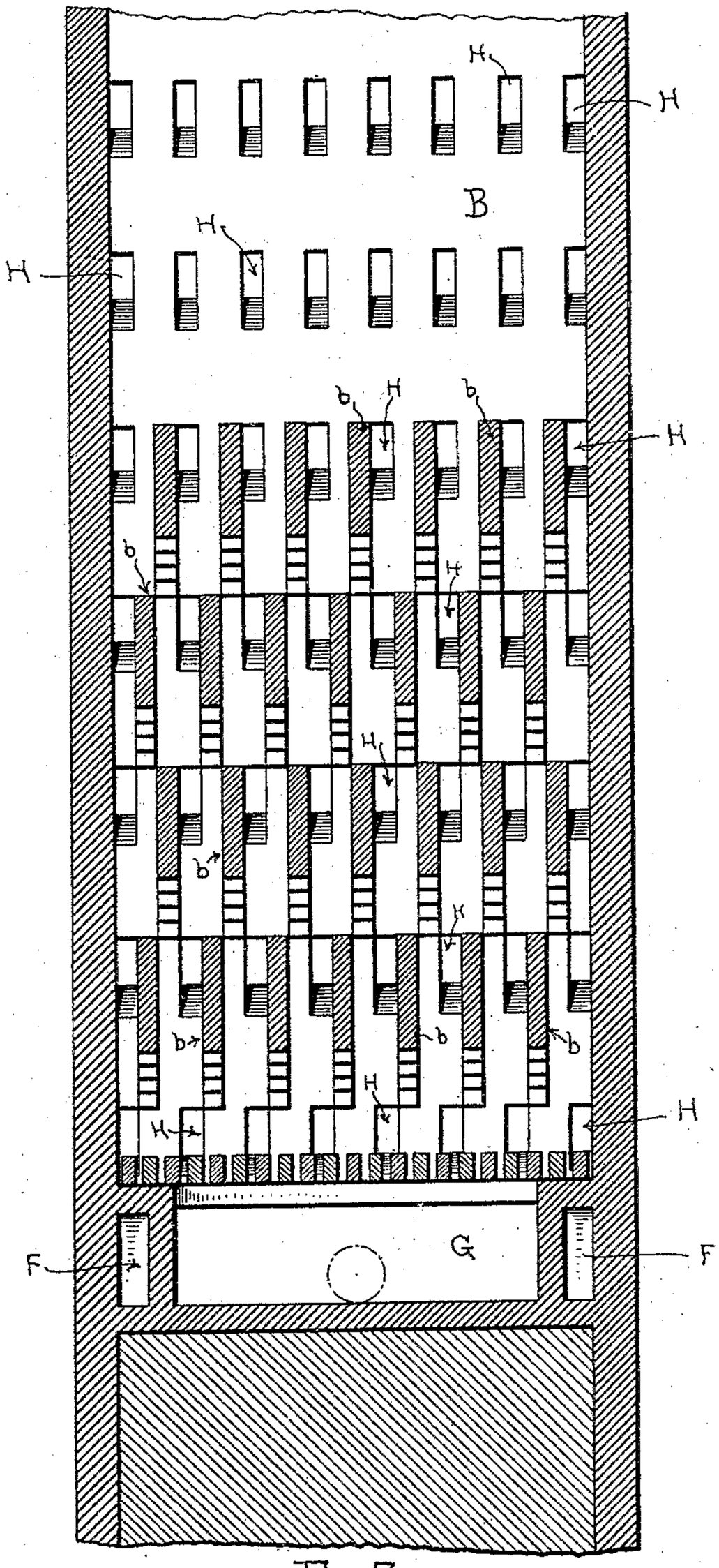

Fig. 3.

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UNITED STATES PATENT OFFICE.

HENRY WEHRUM, OF SCRANTON, PENNSYLVANIA, ASSIGNOR TO THE LACKAWANNA IRON AND STEEL COMPANY, OF SAME PLACE.

ORE-ROASTING FURNACE.

SPECIFICATION forming part of Letters Patent No. 597,628, dated January 18, 1898.

Application filed April 20, 1896. Serial No. 588,252. (No model.)

To all whom it may concern:

Be it known that I, HENRY WEHRUM, a citizen of the United States, residing at Scranton, in the county of Lackawanna and State of Pennsylvania, have invented certain new and useful Improvements in Ore-Roasting Furnaces, of which the following is a specification.

My invention relates to furnaces for subjecting iron ores to the action of heat for the purpose of desulfurizing the same, and has for its object to provide an improved construction whereby this desideratum will be most effectually accomplished.

The salient features embraced in my improved furnace are, first, the novel construction of the furnace as a whole, whereby the same is divided into two separate structures, each containing a series of independent ore-roasting pockets having their independent combustion and waste-gas chambers, said structures being placed side by side with an intervening space that is bridged at the tops of said structures by a supply-platform common to both structures and fed by a railway running longitudinally thereof, whereby the ores to be roasted may be sorted and delivered at will into any or all of the roasting-pockets of either structure from said intermediate platform; secondly, the novel means for affording a thorough air-supply to the ores during the roasting operation; thirdly, the novel means for independently regulating the gas-supply and the draft through the several roasting-pockets, whereby the action of the combustible material on the ores may be effectually controlled, and, fourthly, the novel construction of the independent initial combustion-chambers, whereby the ignited combustible material is somewhat retarded in its passage therethrough and thoroughly mixed and ignited. These objects are accomplished in the manner and by the means hereinafter specifically pointed out and claimed, reference being had to the accompanying drawings, in which—

Figure 1 is an end elevation of my improved furnace, one side of the same being shown in vertical section. Fig. 2 is a top plan view of the same, one side of the same being shown in horizontal section. Fig. 3 is an enlarged detail vertical sectional view of one of the independent combustion-chambers.

Similar letters of reference denote corresponding parts in the several views.

In the said drawings, referring more particularly to Figs. 1 and 2, it will be seen that the furnace consists, essentially, of two separate and independent structures placed side by side and with an intervening open space that is bridged on a level with the tops of said structures by a platform supported on transverse beams P, supported by the adjacent walls of the two structures. For the sake of clearness in understanding the construction of the underlying parts this platform is not shown in Fig. 2. Also located intermediate the two structures is a framework O, supported from masonry pillars O′ and projecting up through said platform to a point some distance above the tops of said structures, where it carries a railway N, running longitudinally of said structures, whereby a supply of ore may be dumped onto said platform. As an additional support for said platform I provide the longitudinal beams Q, bolted to said framework O.

Referring now to Fig. 2, it will be seen that each structure is divided into a series of independent ore-roasting pockets A, each having its separate combustion-chamber B and waste-gas chamber C. Said roasting-pockets are open at their tops to receive a supply of ore from the intermediate platform and at their bottoms open outwardly into discharge-spouts R, having valves S′, controlled by suitable levers S.

The construction of the combustion-chambers B is best shown in Figs. 1 and 3, where it will be seen that each of said chambers is provided with inlets F for the supply of gas, and a chamber G, opening into the outer air, thereby affording a mixed gas and air supply for said chambers best suited for combustion. The gas is supplied to said inlets F through separate branch pipes E, tapping a common main D, running longitudinally of said structures and communicating with a suitable source of supply, a valve *e* being located in

each branch pipe E for the purpose of independently controlling the supply of gas to each combustion-chamber B. Said combustion-chambers are further provided with several series of short walls *b*, transversely arranged and staggered with respect to each other, as best seen in Fig. 3, and adapted to deflect and more thoroughly mix the gas and air in their passage through said combustion-chamber as well as to aid in supporting and strengthening the walls. Communication is afforded from said combustion-chambers B to their respective roasting-pockets A by passages H, the lower edges of which are inclined from the center toward each side, as shown in Fig. 1.

Through the outer walls of the structures I provide a series of openings V, closed by shutters or otherwise and opening into the combustion-chambers B, thereby affording a means for cleaning the passages H, as well as for inspecting the ores in the roasting-pockets A through said passages. The waste-gas chambers C also communicate with their respective roasting-pockets A through passages I, the latter having their lower edges constructed in a manner similar to the passages H.

Connected to each waste-gas chamber is a pipe J, that is tapped into a main pipe K, running longitudinally of the structure beneath the ore-supply platform and communicating with a stack M through pipe L. In each pipe J is provided a suitable valve *j* for independently controlling the draft through each waste-gas chamber C.

Suitable openings W, closed by shutters or otherwise, afford a means for inspecting the ores in the roasting-pockets A from the rear, as well as for cleaning the passages I, as will be understood.

In order that the supply of air to the roasting-pockets A may be increased when desired, I provide a tunnel Y near the bottom of each pocket and connect such tunnel with its pocket by openings *a*, which may have shutters or other closures applied thereto. It will be observed by referring to Fig. 1 that these openings *a* communicate with their respective pockets A at approximately the lower ends of said pockets and at the points of their widest diameter, thus affording a most perfect means for supplying and regulating the air-supply to the ores during the process of desulfurization, the operation continuing until the ores are discharged from the spouts R.

It has been found in practice that owing to the construction of the discharge-spouts R the supply of air therethrough into the lower ends of the pockets is far from sufficient to properly continue the desulfurization of the ores in the lower ends of said pockets, whereas by providing and locating the tunnels Y and openings *a*, as described, the desulfurization will be continued in a most thorough manner throughout the extreme length of the ore-pockets, and the resultant product, discharged from the spouts R, will be found to be thoroughly treated.

Located beneath the discharge ends of the spouts R are a series of bins T, preferably formed of metal and located on the outside of and separate from the roasting structures. These bins are provided with suitable valves *t* in their bottoms, whereby the treated ores may be discharged therefrom and removed by suitable cars running on tracks U beneath said bins.

Upon both sides of the structures are located suitable galleries X to provide a means for inspecting the ores during the roasting operation and for cleaning the passages H and I.

From the above description the operation of my improved furnace will be understood to be as follows: The ores to be treated are dumped onto the ore-receiving platform from cars running on the tracks N at the top of the structure and may be suitably sorted and graded on said platform and fed into any or all of the roasting-pockets A, as may be desired. The combustion-chambers B of such pockets as are in operation being properly supplied with mixed air and gas through the inlets F and chambers G, the ignited products of combustion will pass through the passages H, transversely across the ore-pockets A, and out through the passages I into the waste-gas chambers C, passing from thence through the pipes J, K, and L and out through the common stack M. The valves *e* in each branch gas-pipe E afford a means for separately regulating or cutting off the gas-supply to each combustion-chamber B, while the valves *j* in the pipes J provide for separately regulating the draft through each roasting-pocket A. By employing this construction it will be seen that any number of roasting-pockets may be operated and the supply of gas and the draft through each pocket accurately controlled, the condition of the ore being treated being susceptible of inspection at all times and from both sides through the apertures V and W. It will be understood that each roasting-pocket A is entirely separate from the other roasting-pockets and has its separate combustion and waste-gas chambers, the ore being thus divided into a plurality of tall narrow columns during its passage through said roasting-pockets and may be treated more advantageously than heretofore, it being possible to subject any one or all of the columns of ore simultaneously to an intense heat and at a plurality of points, besides providing for a thorough and independent control over the gas-supply and draft to each column. Moreover, in case of accident to any one of the roasting-pockets or its parts the same may be at once cut out of operation without in any way affecting the operation of the other pockets. Further, by providing an

ore-receiving platform common to both structures I afford a means for storing a large quantity of untreated ore in immediate proximity to the receiving ends of the roasting-pockets, where it may be sorted and graded and, when needed, fed into any of said pockets by a single gang of workmen. The division of the furnace into two structures placed side by side and having an intervening space therebetween bridged by the ore-receiving platform has been found in practice to create an air-draft between said structures at all times, which is highly advantageous in supplying an air-draft to the tunnels Y, from whence it passes through the openings *a* into the roasting-pockets A, thus completing the desulfurizing operation, as hereinbefore specifically described. The treated ore is discharged at intervals from said pockets through the spouts R into the bins T, where it is stored and cooled until such time as it is desired to remove the same in cars running on the tracks U. It is well known that where the highly-heated ore is discharged from the roasting-chambers directly into wooden cars there is great danger of said cars becoming ignited from the ore, while by employing the metallic bins T this danger is obviated, as the ore is afforded an opportunity to cool. Moreover, it is not always convenient to have cars ready to receive the treated ore, and as the discharge must take place at frequent intervals the employment of these bins renders the presence of the cars unnecessary until such time as it is desired to remove the ore in quantity.

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

1. A roasting-furnace, consisting of two independent structures located side by side and having a space therebetween, said structures each containing a series of independent roasting-pockets and means for independently supplying heat thereto, and an ore-receiving platform bridging the space between said structures at substantially the top thereof, substantially as set forth.

2. A roasting-furnace, consisting of two independent structures located side by side and having a space therebetween, said structures each containing a series of independent roasting-pockets and means for independently supplying heat thereto, an ore-receiving platform bridging the space between said structures at substantially the top thereof, and a railway supported centrally above said platform and running longitudinally thereof, the whole arranged and adapted to permit the discharge of ore upon said platform beneath said railway for use in both roasting structures, substantially as set forth.

3. In a roasting-furnace, two independent structures located side by side and having an open space therebetween, a series of independent roasting-pockets in each structure and discharging upon the outer sides of said structures, a platform bridging the space between said structures at substantially the top thereof, and air-tunnels for each roasting pocket opening thereinto at the lower ends thereof from the space intermediate said structures, substantially as set forth.

4. In a roasting-furnace, a combustion-chamber and means for supplying combustible material thereto, a waste-gas chamber, a roasting-pocket intermediate the two and having open connections into said combustion and waste-gas chambers, said roasting-pocket being open at its discharge end for the admission of air, and means for admitting an additional air-supply to the side of the roasting-pocket at approximately its lower end, substantially as set forth.

5. In a roasting-furnace, a combustion-chamber and means for supplying combustible material thereto, a waste-gas chamber, a roasting-pocket intermediate the two and having open connections into said combustion and waste-gas chambers, said roasting-pocket being open at its discharge end for the admission of air, and means for admitting an additional air-supply to the roasting-pocket on the side opposite the discharge end thereof and below the open connections into the combustion and waste-gas chambers, substantially as set forth.

6. In a roasting-furnace, a combustion-chamber and means for supplying combustible material thereto, a waste-gas chamber, a roasting-pocket intermediate the two and having open connections into said combustion and waste-gas chambers, said roasting-pocket gradually enlarging from its upper to its lower end and being open at its discharge end for the admission of air, and an opening for admitting an additional air-supply to the side of said roasting-pocket at the point of its widest diameter, substantially as set forth.

7. In a roasting-furnace, a combustion-chamber and means for supplying combustible material thereto, a waste-gas chamber, a roasting-pocket intermediate the two and having open connections into said combustion and waste-gas chambers, said roasting-pocket being open at its discharge end for the admission of air, a tunnel below the waste-gas chamber and communicating with the outside of the furnace, and an open connection from said tunnel to the base of the roasting-pocket for the admission of an additional air-supply, substantially as set forth.

8. In a roasting-furnace, a plurality of independent roasting-pockets, an independent combustion-chamber for each pocket, an independent waste-gas chamber for each pocket, open connections from each pocket into its combustion and waste-gas chambers, means for supplying combustible material independ-

ently to each combustion-chamber, a main flue with which all the waste-gas chambers are connected, and means for independently controlling the draft through each waste-gas chamber, substantially as set forth.

9. In a roasting-furnace, a combustion-chamber, a roasting-pocket, a waste-gas chamber, open connections from said pocket into said combustion and waste-gas chambers, and short staggered walls in said combustion-chamber, substantially as set forth.

In witness whereof I have hereunto signed my name this 1st day of April, 1896.

H. WEHRUM.

In presence of—
JAMES J. COSGROVE,
WM. H. BERRIGAN, Jr.