

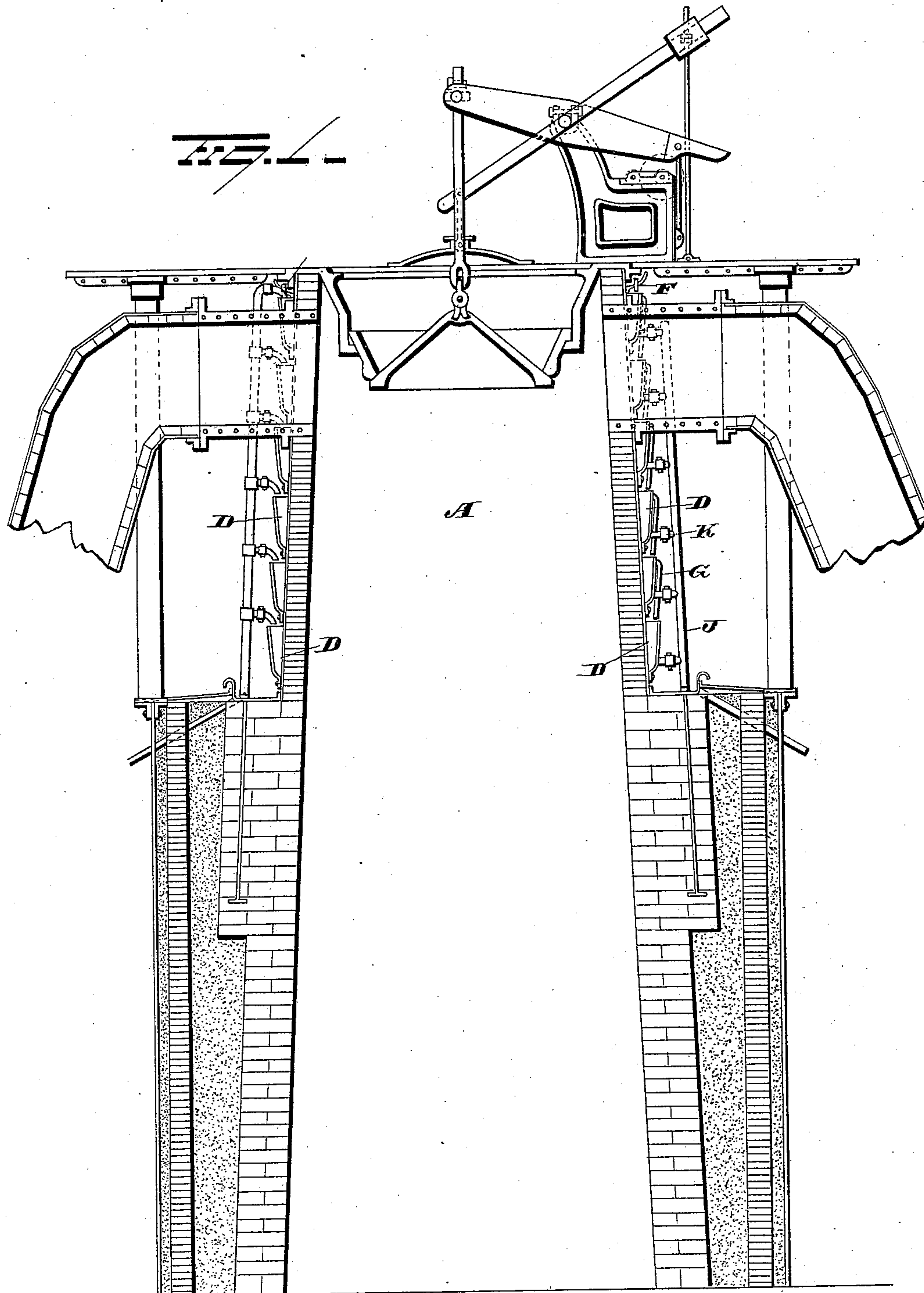
(No Model.)

3 Sheets—Sheet 1.

P. L. WEIMER.
BLAST FURNACE.

No. 287,204.

Patented Oct. 23, 1883.



WITNESSES

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(No Model.)

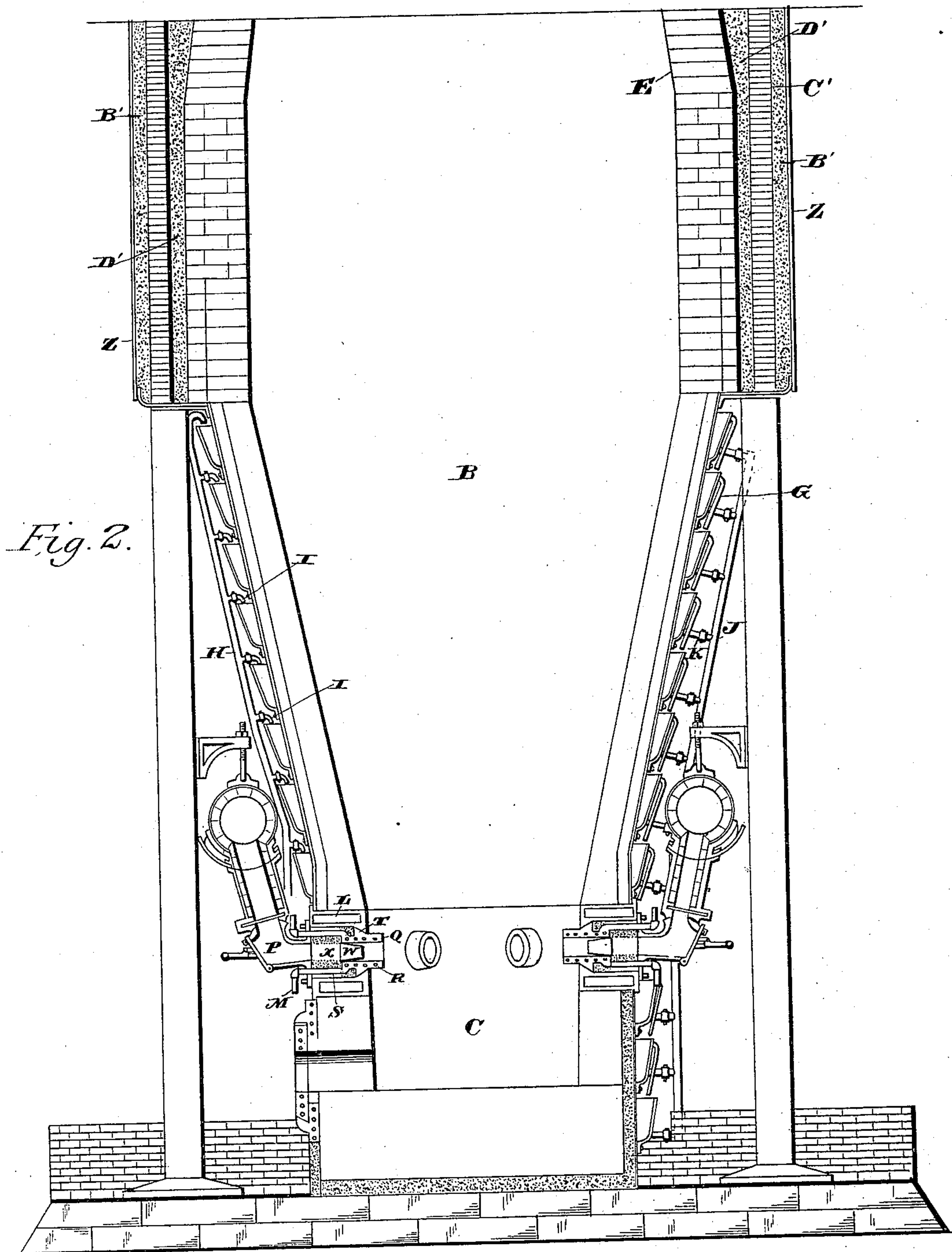
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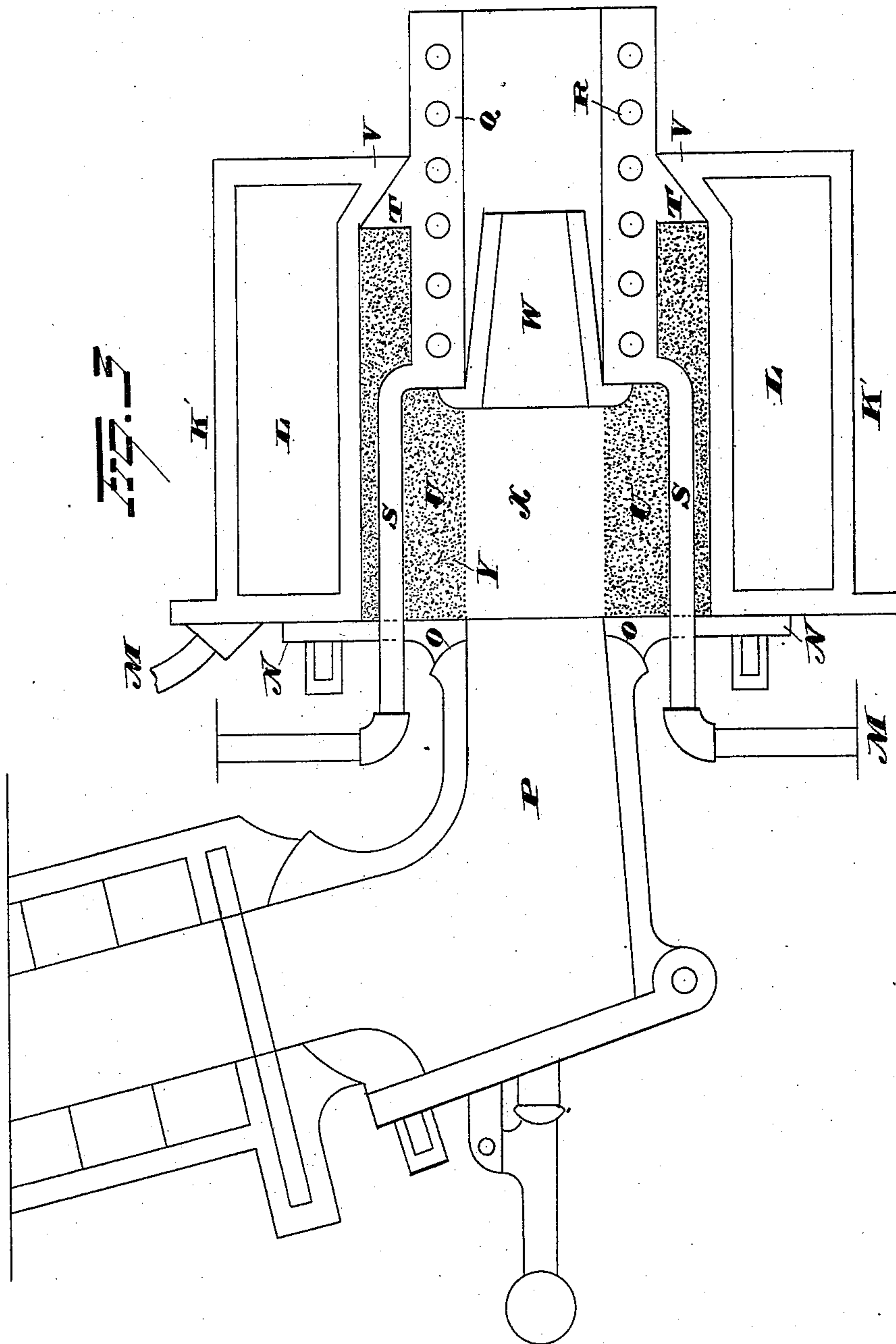
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UNITED STATES PATENT OFFICE.

PETER L. WEIMER, OF LEBANON, PENNSYLVANIA.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 287,204, dated October 23, 1883.

Application filed November 4, 1882. (No model.)

To all whom it may concern:

Be it known that I, PETER L. WEIMER, of Lebanon, in the county of Lebanon and State of Pennsylvania, have invented certain new useful Improvements in Blast-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it pertains to make and use the same.

My invention relates to an improvement in blast-furnaces, and is several fold in its object, comprehending the protection of the lining and the tuyeres of furnaces, and the construction of a secondary lining to assume the place and to fulfill the function of the ordinary lining when the same has been destroyed or rendered useless by the agencies at work within the furnace.

With these objects in view my invention consists in certain novel means for providing for an external circulation of water around the bosh and crucible, as well as the upper portion of the furnace, in providing for a circulation of water through the tuyeres, and also in making provision for inclosing them in envelopes of non-conducting material, and in constructing a monolithic secondary lining to assume the place of the ordinary inner lining when the same is destroyed.

The invention further consists in certain details of construction and combinations of parts, as will be hereinafter described, and pointed out in the claims.

In the accompanying drawings, Figure 1 is a view in vertical section of the upper portion of a blast-furnace constructed in accordance with my invention. Fig. 2 is a similar view of the lower portion thereof; and Fig. 3 is an enlarged view, in section, of the tuyere and water-breast.

The upper portion, A, the bosh B, and the crucible C of the furnace are encircled by a series of flaring, open, annular pans, D, which are secured to the casings of the several zones above mentioned in any desired manner. As shown in the accompanying drawings, the said pans are grouped closely together; but they may be arranged to lie farther apart or to overlap each other, if found desirable. As to their particular construction, they are preferably made in sections, being thus adapted to be independently removed from the furnace. The

circulation of water through them is effected by any suitable system of pipes, two distinct and different arrangements for the purpose being illustrated in the drawings. One system consists of a pipe, F, arranged to bring water from any convenient source of supply and to empty it, respectively, into the uppermost of the series of pans encircling the upper portion of the furnace and the bosh, and of pipes G, adapted to convey the water from pan to pan in downward progression. In virtue of this arrangement, as soon as the uppermost of the pans are filled, the excess of water will be conveyed to the pans next below, thence to the pans beneath them, and so on until it reaches the lowest pans of the series, from which it is discharged either into another series of pans below or into a suitable conduit of escape.

The system above described insures a continuous circulation of water throughout the whole number of pans of each series, the pans depending solely upon a single supply of water. The other system shown in the drawings contemplates an independent supply and discharge pipe for each pan, whereby they may be used collectively or independently. It consists of a general supply pipe, H, provided with a stop-cock, I, for each pan, and a general discharge pipe, J, furnished with connections K for each pan.

The admission of water into the several pans is controlled by the stop-cocks, which are manipulated to obtain the desired distribution of water. Regardless, however, of the particular arrangement employed for filling and emptying the pans, the advantages possessed by them over other appliances for protecting the linings of furnaces by water-circulation remain substantially the same. As compared with other devices, they are comparatively inexpensive, quite as effective, easier of management, readily accessible for repairs, and, moreover, their use incurs no danger of explosions which are caused by water gaining access to the interior of the furnace.

The protection of the tuyeres, which constitutes the second feature of this invention, is effected by a novel construction and combination of parts, whereby provision is made for a circulation of water through them and for inclosing them in non-conducting envelopes. The water-breasts K' are provided with annu-

lar water-chambers L, into which water is admitted and discharged through pipes M and M'. The open outer ends of the breasts are closed by removable plates N, the same being centrally perforated, and provided with ball-bearings O, to receive the ends of the belly-pipe P, through which the air-blasts are introduced.

The tuyeres Q, which are cylindrical in general contour, are provided with coils R and with water-connections S; but any other means of gaining a circulation of water through them may be employed. They are encircled by beveled flanges T, of slightly less diameter than the chambers U of the breasts, and adapted to fit up against the flanged inner walls, V, thereof. Removable conical nozzles W, located in the outer ends of the tuyeres, are designed to concentrate the air-blasts. With the exception of passages X for the air-blasts, all portions of the said chambers U not occupied by the tuyeres and their attachments are filled with plastic clay, Y, or other suitable non-conducting material, which hardens in the presence of the heat of the furnace and forms an excellent protecting-envelope for the tuyeres.

When it becomes necessary to withdraw the tuyeres, the plates N are first removed and the non-conducting envelopes taken out. This done, the tuyeres are readily withdrawn from the water-breasts.

While the furnace shown in the drawings is represented as having its upper portion, bosh, and crucible encircled by pans, it is apparent that they may be restricted to any one or two of such portions of the furnace, and that, if desired, their use may be extended to the body portion thereof.

The third feature of the invention comprehends the construction of a secondary or auxiliary lining to take the place of the ordinary lining when the same is destroyed or rendered useless by the agencies at work within the furnace. This secondary lining may be arranged to extend throughout the entire length of the furnace; but as herein shown it is applied only to the central or body portion thereof. The said body portion consists of an outer casing, Z, a packing of loam or ashes, B', a wall of masonry, C', the secondary lining D', and an ordinary lining, E, the secondary lining being located in a chamber formed between the wall C' and the ordinary lining. The said secondary lining is composed of refractory material of any desired nature and composition, being packed in its chamber in a powdered or semi-plastic state, and gradually transformed by the heat of the furnace into a solid, monolithic, and highly refractory column. The relative thickness of this column and the inner lining may be proportioned as may be found most desirable, not being confined to the arrangement shown in the drawings. As soon as the inner lining has burned away, the secondary lining will be ready to assume its place and fulfill its functions, the usefulness of furnaces provided with the improved secondary lining being greatly pro-

longed with comparatively slight increase in expense.

I am aware that furnaces have been constructed to embody expansion-spaces between their inner and outer casings, and that these spaces have been filled with fire-clay, sand, or broken scoriae, such material being traversed by numerous vertical passages. The packing material employed in this manner has not, however, been refractory, or sufficiently so to fit it to fulfill the function of the inner casing. Neither has it been chosen or packed with reference to its gradual conversion into a solid refractory monolithic column. Moreover, it has always been located at a point too remote from the inner casing to avail as an auxiliary lining, were it adapted to fulfill the demands of the same.

In view of the changes and alterations here suggested, as well as those which may be rendered necessary by the oscillation of the ordinary practical conditions, I would have it understood that I do not limit myself to the exact construction and arrangement of parts herein shown and described, but hold myself at liberty to make such changes and alterations as fairly fall within the spirit and scope of my invention.

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

1. The combination, with an ore-melting furnace, of a succession of two or more water-chambers surrounding the exterior surface of the furnace-wall, one water-chamber being located above the other, a water-supply to the upper chamber, and overflow-pipes leading from the upper part of such chambers to the chamber below, and from the lowest one to the discharge, substantially as set forth.

2. A series of flaring open pans respectively encircling the upper portion, bosh, and crucible of a blast-furnace, and pipes to introduce water into the pans and convey it from pan to pan in downward progression, substantially as set forth.

3. A series of flaring open pans respectively encircling the upper portion, bosh, and crucible of blast-furnaces, and pipes to introduce water into the uppermost pan of each series to convey the water from pan to pan in downward progression and to discharge it from the lowest pan of each series, substantially as set forth.

4. The combination, with a water-breast traversed by a cylindrical aperture and having a beveled inner wall, of a cylindrical tuyere encircled by a beveled flange adapted to fit up against the inner wall of the breast, and an envelope of non-conducting material filling the vacant space in the aperture of the said breast, except for a passage for the air-blast, substantially as set forth.

5. The combination, with a water-breast traversed by a cylindrical aperture and having a beveled inner wall, of a removable plate

provided with a bearing for the belly-pipe, and located over the outer end of the aperture in the water-breast, a cylindrical tuyere encircled by a beveled flange, and adapted to
5 have a circulation of water through it, a nozzle located in the tuyere, and an envelope of non-conducting material filling the vacant space in the aperture of the water-breast, except for a passage of the air-blast, substantially as set
10 forth.

6. The combination, with the inner lining of a furnace, of a refractory solid monolithic

column surrounding the same, and arranged to take its place when injured or burned away, said monolithic column being formed as de- 15 scribed, substantially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

PETER L. WEIMER.

Witnesses:

GEORGE HAFFMAN,
GEO. W. KREIDER.