

(No Model.)

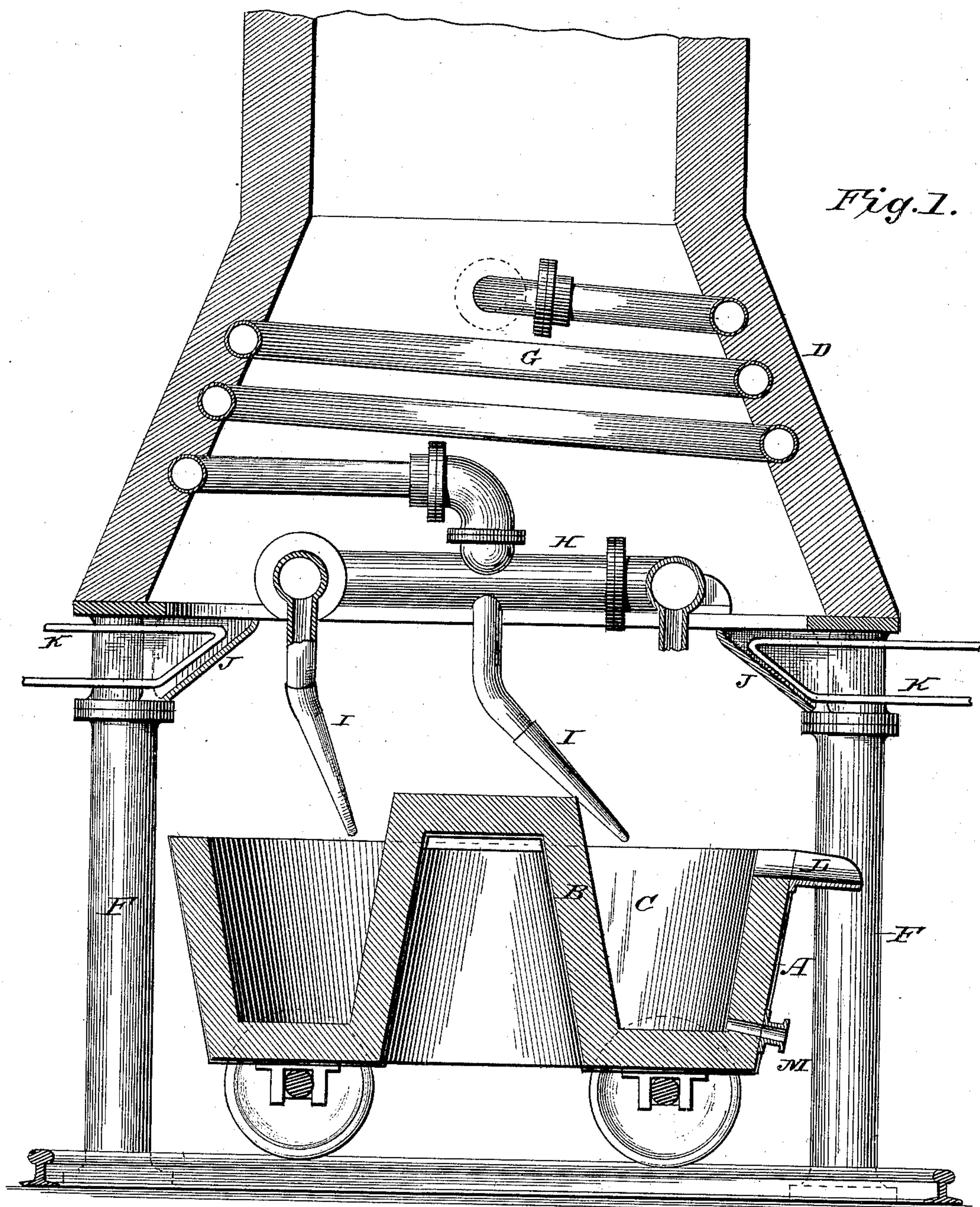
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P. L. WEIMER.

APPARATUS FOR CONVERTING IRON INTO STEEL.

No. 324,903.

Patented Aug. 25, 1885.



WITNESSES:

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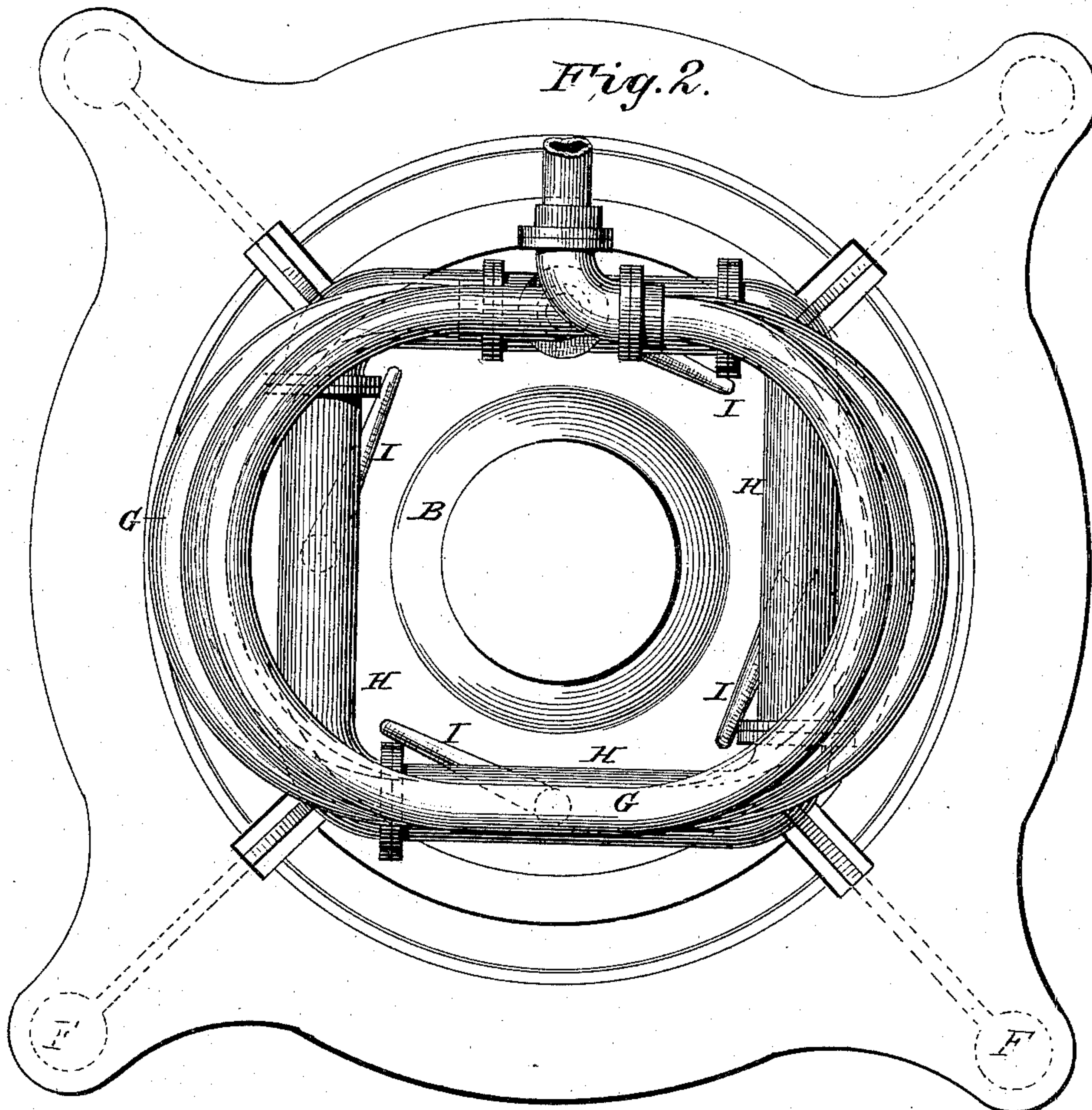
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P. L. WEIMER.

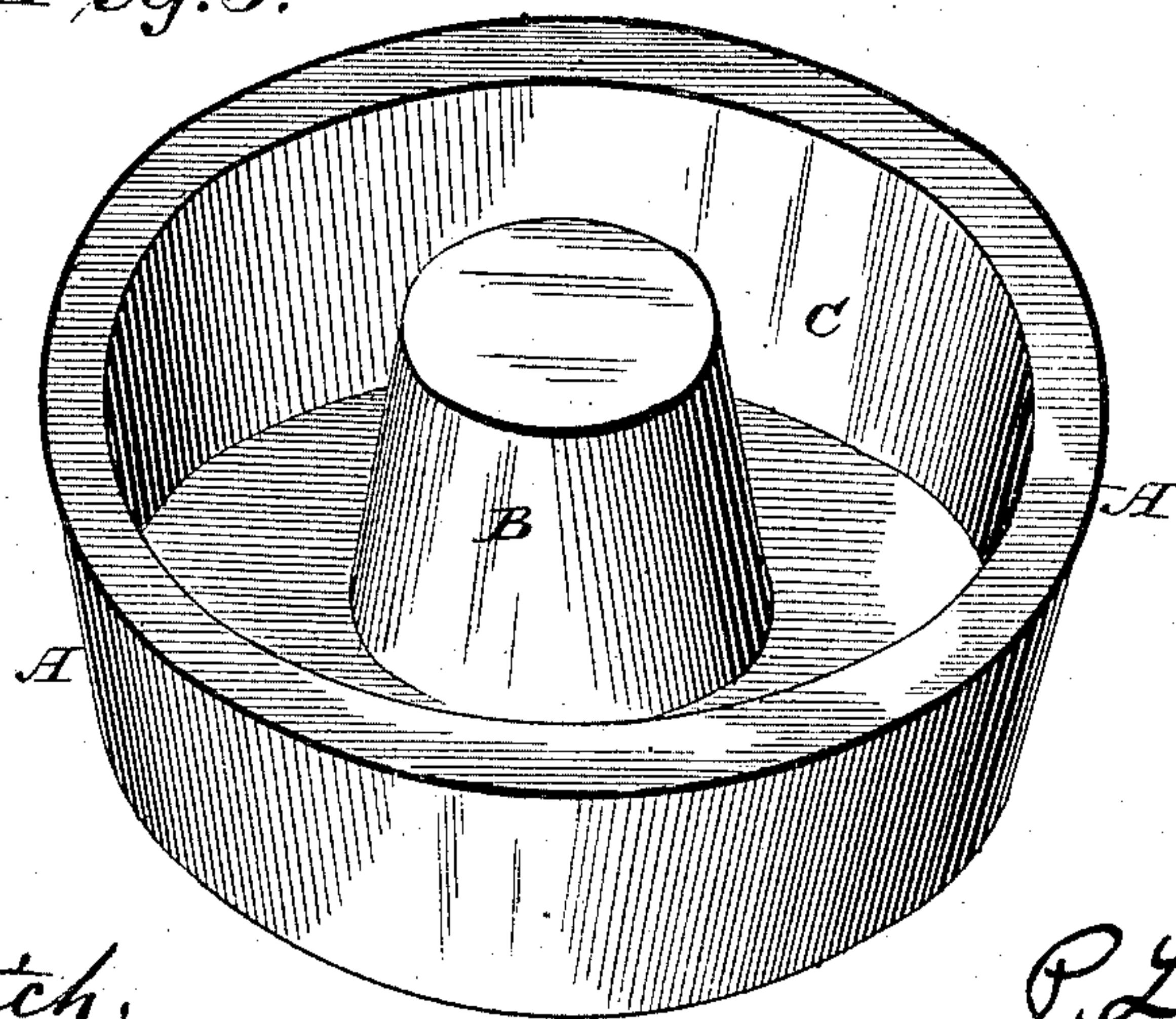
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*Fig. 3.*



WITNESSES:

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# UNITED STATES PATENT OFFICE.

PETER L. WEIMER, OF LEBANON, PENNSYLVANIA.

## APPARATUS FOR CONVERTING IRON INTO STEEL.

SPECIFICATION forming part of Letters Patent No. 324,903, dated August 25, 1885.

Application filed June 9, 1885. (No model.)

*To all whom it may concern:*

Be it known that I, PETER L. WEIMER, a citizen of the United States, residing at Lebanon, in the county of Lebanon and State of Pennsylvania, have invented certain new and useful Improvements in Apparatus for Converting Iron into Steel; 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 appertains to make and use the same.

In the art of making steel many processes have been devised for treating molten iron—the product of blast-furnaces—to relieve it of impurities, such as phosphorus, sulphur, carbon, and silicon, which are detrimental to its uses in the mechanic arts. One of the most important questions presented to the steel-manufacturer is, how to reduce the cost of the necessary appliances to convert iron into steel. The great expense attending the construction of the Bessemer plant is one of the chief reasons for there being so few such plants in use for the manufacture of refined metal, as the expense inherent to the construction and operation of such a plant cannot be supported by the ordinary line of trade.

The object of my invention is to provide means for converting molten iron—the product of the blast-furnace—into steel on the Bessemer plan at the minimum of cost, and which shall be simple in its construction, reliable in its operation, and adapted to be worked by means of an air-blast derived from a high-pressure blowing-engine.

Heretofore it has been proposed to treat molten cast-iron by introducing air into it below the surface of the metal to decarbonize the iron, the converter being a closed vessel mounted upon wheels, and adapted to be run into the casting house or in close proximity to the furnace. It has also been proposed to introduce air into a converter below the surface of the metal through tuyeres entering the converter at a tangent, and imparting to the metal a whirling or circular motion. In both instances referred to the tuyeres are exposed to the molten metal, and some means must be employed for preventing the metal

from entering the mouth of the tuyeres, and in the latter instance the metal simply revolves in a cylindrical vessel without being agitated by the air-blast introduced below the surface of the metal. It has also been proposed to agitate the metal by directing a blast or blasts of air upon the surface thereof.

My invention consists of an open annular converter mounted upon wheels, and adapted to be run into the casting-house or near to the furnace stack, to receive the molten metal directly therefrom, then to be removed to a stack or chimney, under which a distributing-pipe provided with a series of nozzles is suspended, where it is violently agitated by blasts of air directed into it from the surface and a circular current motion imparted thereto.

In the accompanying drawings, which form part of this specification, Figure 1 represents a vertical section of my improved apparatus. Fig. 2 is a plan view. Fig. 3 is a perspective view of the converter.

Reference being had to the drawings and the letters of reference marked thereon, A represents a converter, made of boiler-iron, and lined with refractory material, such as is common to the art. A cone, B, in the center of the converter forms an annular chamber, C, between the two walls. The converter is mounted upon wheels adapted to run on an ordinary railroad-track.

D represents a chimney, having its base expanded outwardly, and supported upon a mantel-ring, E, which in turn is supported on columns F, and is of sufficient height to carry off the gases arising from the iron under treatment by natural draft. The stack may be built at any convenient place in the casting-house of the furnace, with its upper end projecting through the roof. When the natural draft of the chimney is not sufficiently strong to draw off all the gases arising from the converter, detachable inclosed doors or aprons (not shown) lined with fire-brick or other non-conducting material are suspended upon the columns, and reach from the mantel-ring E down to the top of the converter A, thus increasing the capacity of the chimney.

Within the chimney D is an air-supply



pipe, G, coiled elliptically, as shown in the plan view, Fig. 2. The long side of the coil is supported in the masonry, as shown in Fig. 1.

II represents an air-distributing pipe, provided with a series of contracted nozzles, I, projecting downwardly and inclined to their axes in a direction tangential to a curve located in a horizontal plane. The distributing-pipe H is supported by brackets J, attached to the columns-D, to protect the brackets from the destructive effects of the heated metal in the converter. They have cast in them pipes K, through which water is kept in circulation.

The several parts being constructed substantially as described, the operation is as follows: Molten cast-iron having been drawn from a furnace into the converter A, it is moved under the chimney D, directly below the distributing-pipe H. Air from an ordinary blowing engine is then supplied through the pipe G, distributing-pipe H, and nozzles I. The latter, being inclined and arranged at a tangent to the annular chamber C of the converter, direct the air upon the surface of and project it down into the body of the metal, first imparting to it a circular current motion in the annular chamber, and also agitating it, whereby the metal is rapidly decarbonized. The air supplied to the molten metal is heated by the body of metal contained in the converter and by the gases arising from the metal under treatment as they ascend through the chimney D in contact with the pipes containing the air.

To remove the phosphorus and foreign matter from the iron, burnt lime, fluor-spar, or their equivalents, is thrown upon the surface of the molten metal, and is carried down into the body thereof by the air-blasts, thus thoroughly mingling or mixing the lime with the metal. The slag, as it rises to the surface, is skimmed off by an operator, and discharged from the converter by means of the spout L. When the metal has been refined to the degree desired, the blast is cut off and the converter removed to a suitable point, when the steel is withdrawn through the outlet M, which is provided with a suitable gate-valve. (Not shown.) Another converter is moved into the position above described and the operation repeated.

It will be observed that by my improved apparatus the air is heated without incurring additional expense, the air and the lime thoroughly mixed with the molten metal, the metal kept in a continuous circular current motion, and means are provided at the minimum of first cost, and the operation maintained at a great reduction in the expense usually attending the refining of metals.

A very important feature of my invention consists in placing the coil of pipe through which air is conducted in the chimney through which the escaping gases and the heat from

the converter are passing to the atmosphere, whereby the air supplied to the converter is heated to such a degree as to materially aid the process of converting iron into steel, and by thoroughly agitating the molten metal by blasts of hot air under high pressure a smaller quantity of air is required than in many of the processes of making steel now commonly practiced.

Having thus fully described my invention, what I claim is—

1. A chimney or stack having an outwardly-expanded base, as shown, in combination with an air-supply and a distributing pipe arranged within and supported by the masonry forming said chimney or stack, substantially as described.

2. A chimney or stack having an outwardly-expanded base, in combination with an air-supply pipe and an annular distributing-pipe provided with contracted nozzles inclined downward and forward, substantially as shown and described.

3. A chimney or stack, in combination with an air-supply pipe and a distributing-pipe provided with depending nozzles inclined downward, and also in a direction tangential to a curve located in a horizontal plane, substantially as shown and described.

4. A chimney or stack having an outward-expanded base, supported by a mantel-ring resting upon columns, in combination with an air-supply and a distributing pipe contained within and supported by the masonry forming said chimney, substantially as described.

5. The combination of an open portable converter having an annular chamber and an air-distributing pipe arranged axially above the converter and provided with nozzles inclined downward, and also in a direction tangential to a curve located in a horizontal plane, substantially as described.

6. The combination of an open portable converter provided with an annular chamber and an air-distributing pipe having nozzles inclined downward, and also at a tangent to the annular chamber, whereby a circular current motion is imparted to the molten metal contained in the converter by the air directed upon the surface and into the body of the metal, substantially as described.

7. The combination of an open converter, a chimney having an outward-expanded base supported upon columns, an elliptic air-supply pipe supported by the masonry forming the chimney, and a distributing-pipe arranged horizontally above the converter, provided with a series of nozzles, and adapted to be heated by the metal in the converter and the gases rising therefrom, substantially as described.

8. The combination of an open converter having an annular chamber, an air-supply pipe, and an annular distributing-pipe provided

with depending nozzles inclined downward, and also in a direction tangential to a curve located in a horizontal plane, and a forced blast of air adapted to project line thrown  
5 upon the surface of the metal into the body thereof, substantially as described.

9. The combination of a converter, a chimney having an outwardly-expanded base, and an air-supply and a distributing pipe arranged  
10 above the converter and heated therefrom, the nozzles projecting downward and at a

tangent to the annular chamber of the converter and extending near to the surface of the metal, whereby hot air under pressure is supplied to the metal, substantially as described. 15

In testimony whereof I affix my signature in presence of two witnesses.

PETER L. WEIMER.

Witnesses:

J. WEIDMAN MURRAY,  
TOBIAS REINOEHL, (S. S.)