

(No Model.)

2 Sheets—Sheet 1.

P. H. ADAMS, Jr.

SLAG FURNACE.

No. 379,625.

Patented Mar. 20, 1888.

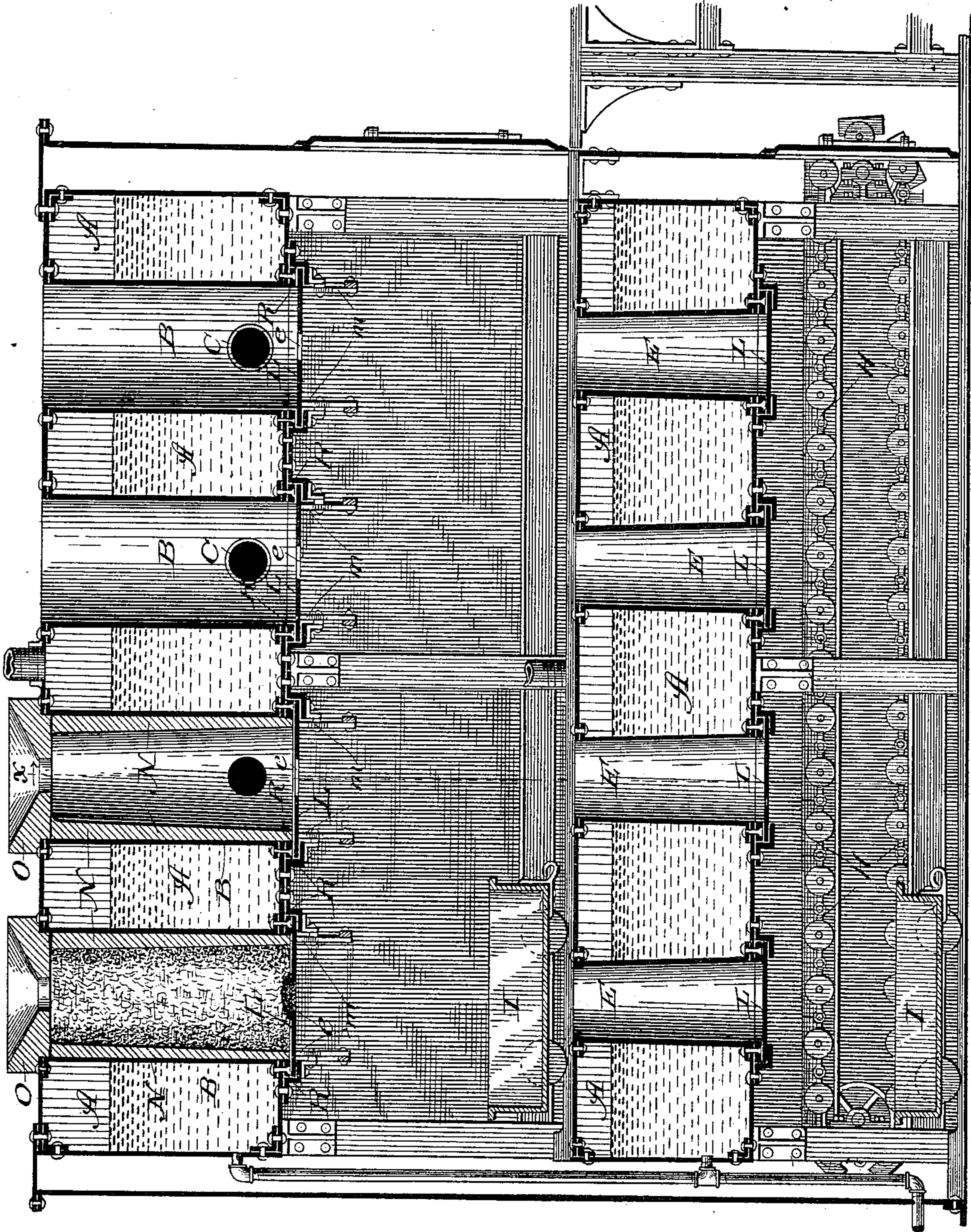


Fig. 1.

Witnesses:  
Edw. Taylor.  
Charles Gorton.

Inventor:  
Phineas H. Adams, Jr.  
By Banning & Banning.  
Att'ys

(No Model.)

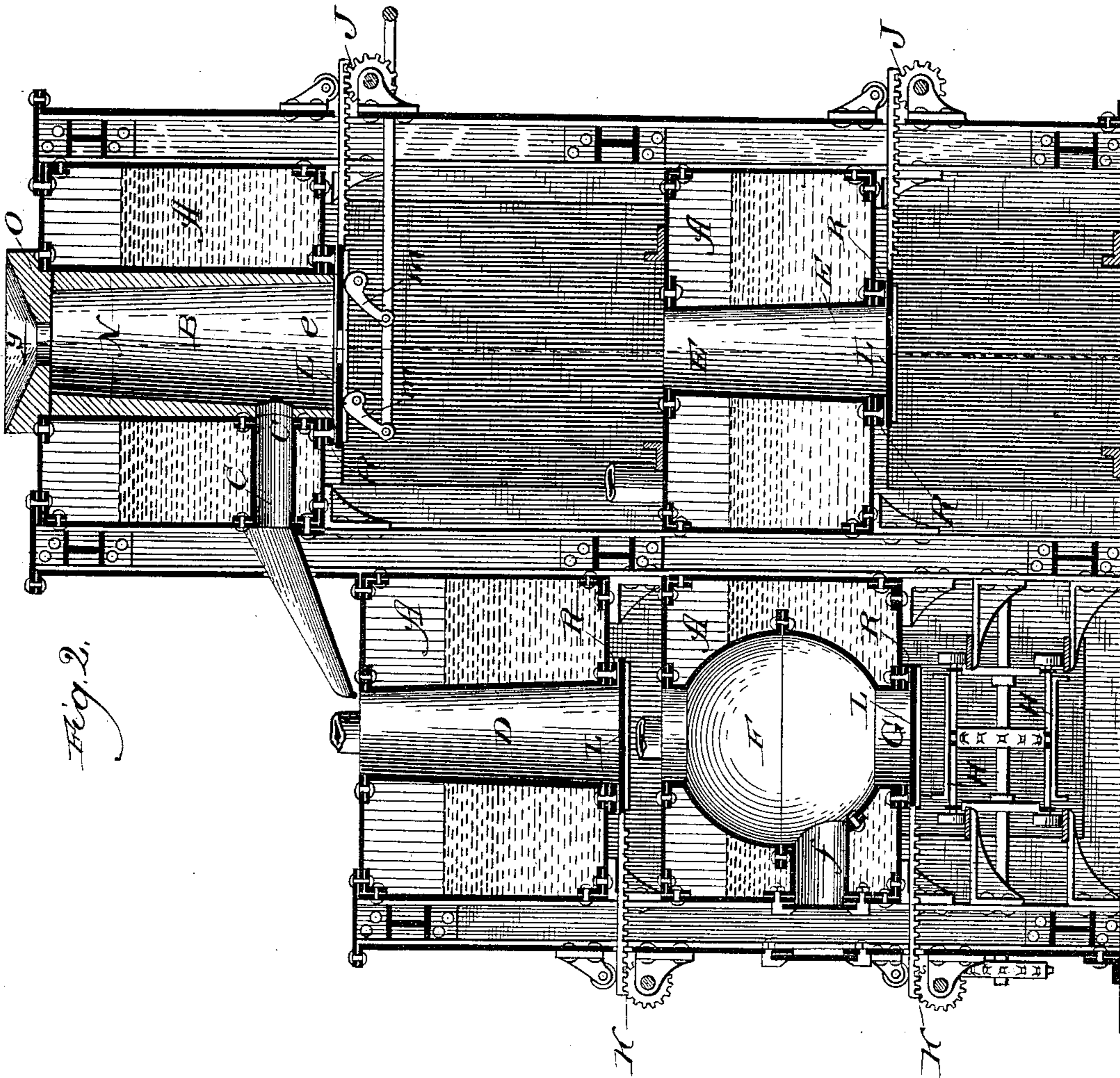
2 Sheets—Sheet 2.

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No. 379,625.

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Witnesses:  
Chas. E. Gorton.  
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# UNITED STATES PATENT OFFICE.

PHINEAS H. ADAMS, JR., OF CHICAGO, ILLINOIS.

## SLAG-FURNACE.

SPECIFICATION forming part of Letters Patent No. 379,625, dated March 20, 1888.

Application filed December 27, 1887. Serial No. 259,110. (No model.)

*To all whom it may concern:*

Be it known that I, PHINEAS H. ADAMS, Jr., a citizen of the United States, residing at Chicago, Illinois, have invented certain new and useful Improvements in Slag Steam-Generators, of which the following is a specification.

In the drawings, Figure 1 is a longitudinal vertical section of my improved slag steam-generator, taken through the line *yy* of Fig. 2, looking in the direction of the arrow. Fig. 2 is a transverse vertical section taken through the line *xx* of Fig. 1, looking in the direction of the arrow.

In the drawings, A represents the boiler; B, the main slag-holding receptacles; C, pipes through which a portion of the slag may be drawn off from the main receptacles into smaller or assistant receptacles; D, such assistant receptacles; E, auxiliary receptacles placed under the main receptacles, into which slag may be introduced through the hole *e* in the bottom of the main receptacle; F, an enlarged receptacle beneath the assistant receptacles D; *f*, an opening into the enlarged receptacle F, through which the interior may be reached; G, the outlet to the enlarged receptacles F; H, a traveling apron placed under the openings G; I, a car or conveyer which may be run under the receptacles B and E; J, racks and pinions for moving a sliding bottom in or out under the receptacles B and E; K, racks and pinions for moving a sliding bottom out or in under the receptacles D and F; L, such sliding bottoms; *m*, cams for forcing the sliding bottoms tightly and securely against the bottom of the main slag-receptacles B; N, linings or thimbles placed on the interior of the main slag-holding receptacles, and O a cover or cap for such receptacles.

In making my improved slag steam-generator I adapt it particularly for use in connection with smelting or other furnaces which discharge a large quantity of slag at the same time, but at considerable intervals apart. Such furnaces often discharge twenty, thirty, or forty tons of molten slag at one time and make no further discharge for some hours. To utilize the immense heat and steam generating power of this large discharge, I make a steam-generating boiler with one or more

main slag-holding receptacles, B, within them, as shown in the drawings.

I have represented my improvement in connection with four main slag-holding receptacles, each standing within a boiler-shell and surrounded by water which is to be converted into steam. Of course a greater or less number of such receptacles can be used to correspond to the capacity of the furnace in connection with which my improvements are to be used, and they need not be necessarily entirely surrounded with water, though it is preferable that they should be, and by the term "surrounded" I mean either wholly or partially surrounded.

It will be understood that the boiler A is made of proper boiler-iron and of sufficient strength and with sufficient closeness of joints to retain the water and steam and resist the internal pressure which may be produced while the steam is being generated, and I need not describe in detail the construction of the boiler. I will simply say that it is to be made of a size and shape to receive within it the slag-holding receptacle or receptacles. These main slag-holding receptacles may be made of shells or chambers of boiler-iron, as shown in the drawings, and they may be lined with a thimble, N, of any suitable material to give them proper strength and protect the casing of boiler-iron composing the slag-holding receptacle from the heat of the slag, and also for the purpose of preventing the too-rapid escape or radiation of the heat. While I prefer to line the slag-holding receptacle with this thimble, yet it may be dispensed with entirely, if preferred. I would only recommend its use in connection with the main slag-holding receptacle. To cover the main receptacles, I make a cap or cover, O, which is preferably of funnel shape at the top and provided with a hole through which the molten slag may be introduced, though the upper ends of the receptacles may be narrowed or contracted sufficiently to afford all the covering required, so that a separate cap would not be needed.

Immediately beneath the slag-holding receptacles, and constituting a bottom to the same, I arrange sliding plates L, which may be termed "removable bottoms." These sliding plates may be moved back and forth by means

of the racks and pinions J and K, so as to close the bottoms of the receptacles or to open them, as may be desired, at different stages of the operation. To press the plates L firmly against the bottom of the receptacle B, I employ one or more pivoted cams connected with a rod or lever by which they may be turned to bring a greater or less degree of pressure against the bottom. These sliding bottoms L are arranged preferably immediately beneath rings R, riveted or otherwise securely fastened around and encircling the bottoms of the receptacles to afford the necessary smoothness for the sliding bottoms to move against, as well as strength to the bottom of the receptacles. This ring in section is shown in the drawings wherever slag-holding receptacles appear. The sliding bottoms L of the receptacles B are preferably provided with a hole, *e*, which may be stopped with clay or other material when the slag is run into the receptacles, so that it may be wholly or partially knocked out and the receptacle tapped at the bottom, to permit the molten slag from the interior of the mass to flow down into auxiliary receptacles E placed beneath them. These auxiliary receptacles can be used or not, as may be preferred, though I consider that they are desirable, as they enable me to draw molten slag from the center of the mass in the receptacles B after its outer portions have become more or less cooled. These auxiliary receptacles E also stand in a boiler containing water to be generated into steam, as shown in the drawings. To still further enable me to draw off slag from the main receptacles, I prefer to employ another series of assistant slag-receivers, D, which are arranged in boilers at one side of the boilers containing the main receptacles. I therefore provide the main receptacles with an opening, pipe, or conduit, C, which enables me to draw off more or less slag as it flows into the main receptacles. The object of the assistant receptacles D is more to provide for any excess of slag in the receptacles B, as they may not be sufficient to contain all of the slag to be discharged from the furnace at one time. In this respect they are different from the auxiliary receivers E, which are intended to permit me to draw off slag from the center after the edges have become cool. When not in use, the openings or pipes C may be stopped with clay or in any other suitable manner.

Beneath the receptacles D, I prefer to arrange enlarged chambers or receptacles F, into which the slag from the receivers D may be allowed to fall after becoming wholly or partially cool. To utilize whatever heat there may be in the slag as it drops into the chambers F, I inclose these chambers in a boiler and surround them with water, as shown in Fig. 2. As above suggested, sliding bottoms are also arranged under the receptacles D, E, and F to permit the slag when it becomes cooled to be dumped or discharged from them; but these sliding bottoms need not be provided

with the hole *e*, as are the bottoms of the main receptacles. I have designated all of these sliding bottoms as L. After the slag, partially cooled and in large lumps, perhaps, has been discharged from the receptacles D into the enlarged chambers F, it may be broken into smaller pieces through the hole *f*. When it is desired to finally discharge the slag from the chambers E and F, the bottoms are opened by means of the racks and pinions and the slag allowed to drop. Under the receptacles B and E, I prefer to run a car or conveyer to receive the cooled slag and carry it away, while under the enlarged chambers F, I prefer to arrange a traveling apron, H, as shown in the drawings, operated by sprocket-wheels to carry off the cooled slag. Suitable doors or other means of ingress may be provided beneath the receptacles.

Of course it will be understood that proper pipes will be employed to collect and carry the steam generated by the molten slag to the cylinder or place of use, and this arrangement need not be described in detail. I may further add that it is of the nature of slag to contract somewhat as it cools, and that by making the lower ends of the slag-holding receptacles slightly larger in internal diameter than the upper ends the slag, when cool, will readily discharge itself when the bottoms are opened.

I will say, in conclusion, that while I prefer to employ all the slag-holding receptacles above described, yet none of them are indispensable to the operation of my slag steam-generator, except the main slag-holding receptacles B. The receptacles D and E are employed as assistants and auxiliaries, and in some cases it may be found advisable to dispense with their use.

What I regard as new, and desire to secure by Letters Patent, is—

1. In a slag steam-generator, the combination of a main slag-receiving receptacle having a removable bottom provided with a hole or opening, an auxiliary slag-receiving receptacle arranged thereunder to receive slag flowing from such hole or opening, and boilers containing water surrounding the main and the auxiliary slag-receiving receptacles, substantially as described.

2. In a slag steam-generator, a slag-receiving receptacle provided with a pipe or conduit to draw off slag and a removable bottom, in combination with a boiler containing water surrounding the slag-receiving receptacle, substantially as described.

3. In a slag steam-generator, the combination of a main slag-receiving receptacle, an assistant slag-receiving receptacle arranged at the side thereof to receive excess of slag from the main receptacle, and a pipe or conduit connecting the two and conveying the slag from the main to the auxiliary receptacle, and boilers containing water surrounding the main and the auxiliary slag-receiving receptacles, substantially as described.

4. In a slag steam-generator, the combina-

tion of a slag-receiving receptacle having a removable bottom, cams to press up such bottom into close contact with the receiver, and a boiler containing water surrounding the slag-receiving receptacle, substantially as described.

5. In a slag steam-generator, the combination of a slag-receiving receptacle having a removable bottom, a ring, R, encircling the

lower end of the receptacle and affording a bearing for the removable bottom, and a boiler containing water surrounding the slag-receiving receptacle, substantially as described.

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Witnesses:

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