No. 728,700. PATENTED MAY 19, 1903.

O. S. GARRETSON.

BLAST FURNACE.

APPLICATION FILED FEB. 7, 1901. RENEWED OCT. 10, 1902.

NO MODEL. 2 SHEETS—SHEET 1.

Fig. 1.

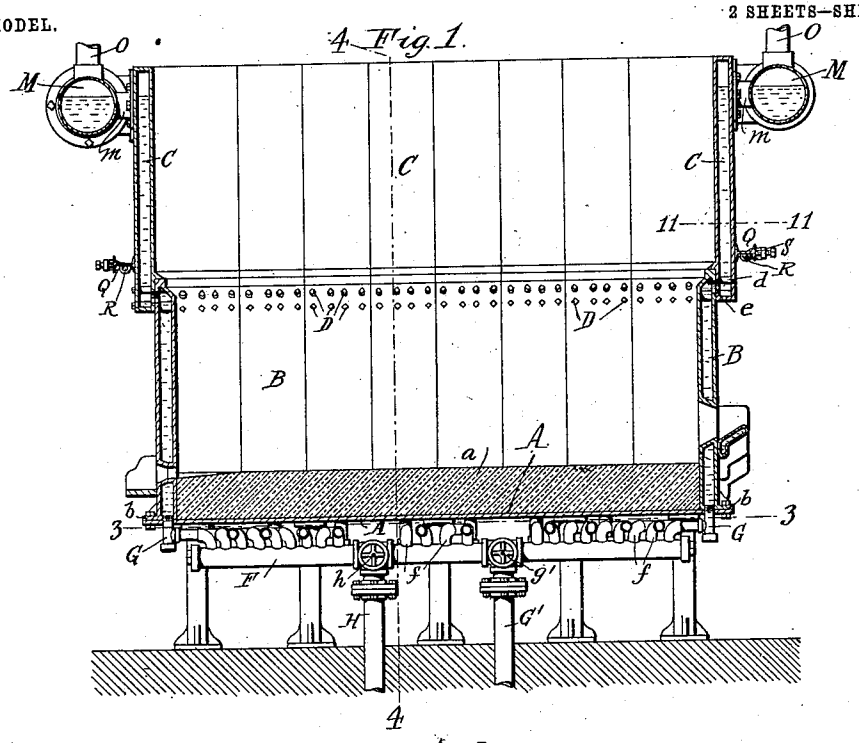


Fig. 2.

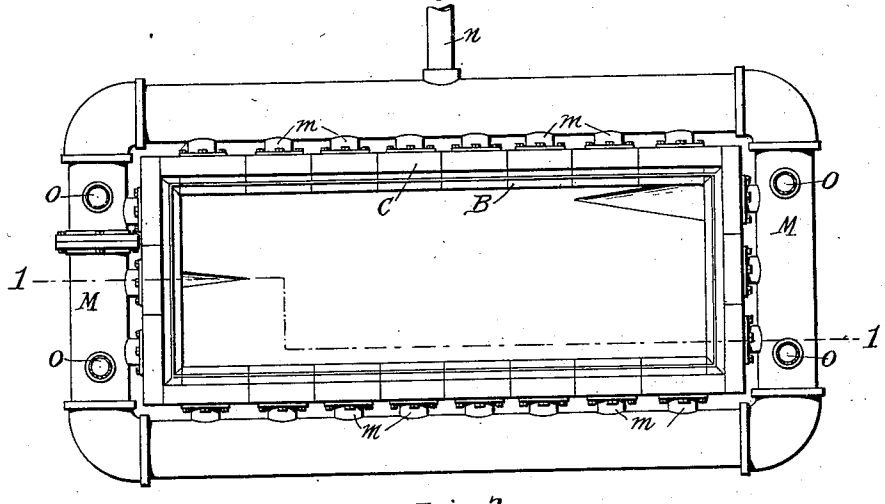
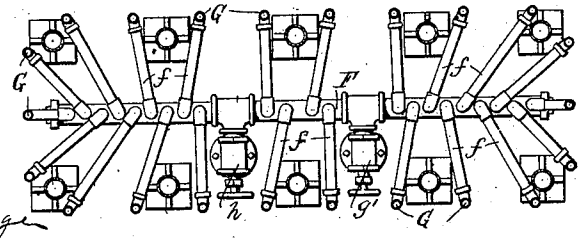


Fig. 3.



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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

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NO MODEL. 2 SHEETS—SHEET 2.

Fig. 4.

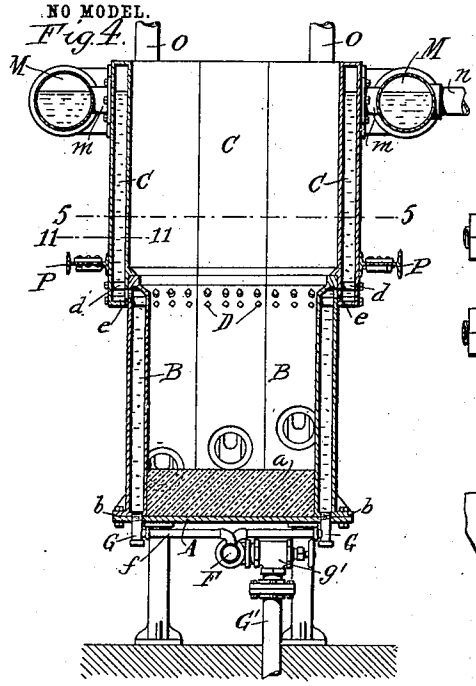


Fig. 6.

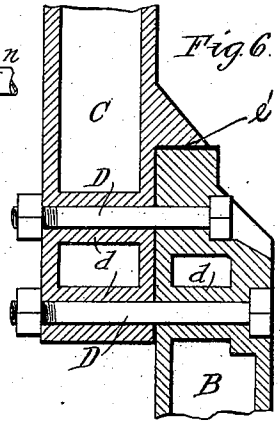


Fig. 7.

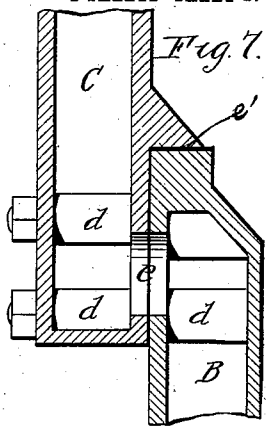


Fig. 8.

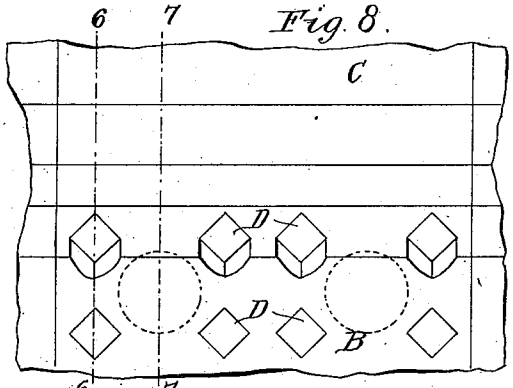


Fig. 5.

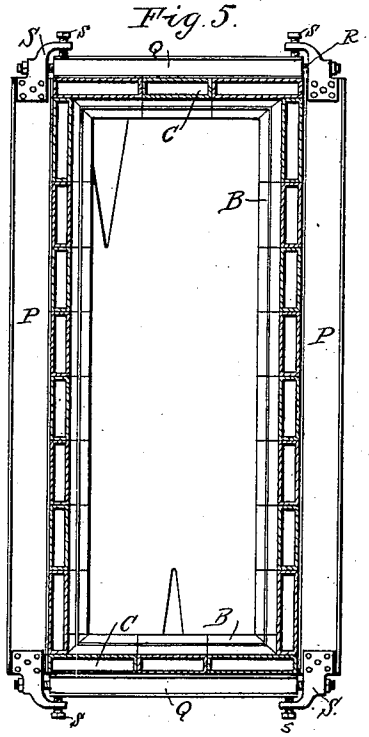


Fig. 9.

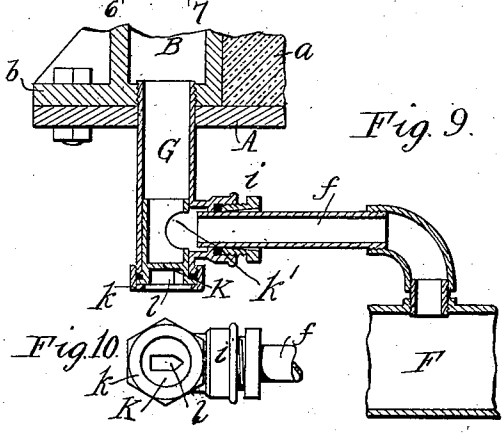
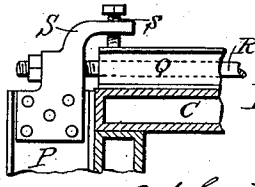


Fig. 10.

Fig. 11.



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No. 728,700. Patented May 19, 1903.

UNITED STATES PATENT OFFICE.

OLIVER S. GARRETSON, OF BUFFALO, NEW YORK, ASSIGNOR TO GARRETSON FURNACE COMPANY, OF PITTSBURG, PENNSYLVANIA, A CORPORATION OF WEST VIRGINIA.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 728,700, dated May 19, 1903.

Application filed February 7, 1901. Renewed October 10, 1902. Serial No. 126,802. (No model.)

To all whom it may concern:

Be it known that I, OLIVER S. GARRETSON, a citizen of the United States, and a resident of Buffalo, in the county of Erie and State of New York, have invented a new and useful Improvement in Blast-Furnaces, of which the following is a specification.

This invention relates to that class of blast-furnaces in which the stack of the furnace is composed of water-jacketed sections. Furnaces of this kind are used to a considerable extent for smelting the ores of lead, copper, silver, and gold.

The object of this invention is to improve the construction of this class of furnaces with a view of improving the circulation of the water through the jackets, facilitating the filling and emptying of the water-spaces and the cleaning of the same, and rendering the furnace strong and durable.

In the accompanying drawings, consisting of two sheets, Figure 1 is a longitudinal vertical section of my improved furnace in line 1 1, Fig. 2. Fig. 2 is a top plan view of the same. Fig. 3 is a horizontal section in line 3 3, Fig. 1, looking down upon the pipes underneath the furnace-bottom. Fig. 4 is a vertical transverse section in line 4 4, Fig. 1. Fig. 5 is a horizontal section in line 5 5, Fig. 4. Figs. 6 and 7 are vertical sections, on an enlarged scale, through the lower end of an upper water-jacket and the upper end of an adjacent lower water-jacket in lines 6 6 and 7 7, Fig. 8. Fig. 8 is an inside elevation of these parts. Fig. 9 is a vertical section, on an enlarged scale, through the lower end of one of the lower water-jackets and the water-pipes connected therewith. Fig. 10 is a bottom plan view of the upright drain-pipe connected with the lower end of the jacket. Fig. 11 is a horizontal section, on an enlarged scale, of one of the corners of the furnace, the section being taken in lines 11 11, Figs. 1 and 4, above the tie-beams and rods.

Like letters of reference refer to like parts in the several figures.

A represents the rectangular bottom plate of the furnace, upon which the bottom *a*, of fire-brick, rests, as usual.

B represents the lower tier of upright water jackets or sections arranged upon the bottom plate A outside of the bottom *a*. These jackets are provided at their lower ends with outwardly-projecting flanges *b*, by which they are secured to the bottom plate A.

C represents the upper tier of upright water jackets or sections arranged outside of the jackets of the lower tier and extending upwardly therefrom. The upper jackets C are fitted with the inner face of their lower portion against the outer face of the upper portion of the lower jackets, and these jackets are secured together at their overlapping lower and upper ends by horizontal bolts D, which pass through hollow stays *d*, formed in the jackets. Each jacket or section has the form of a hollow flat rectangular box and is cast complete in one piece. The stays *d* connect opposite walls of the jacket, as shown in Figs. 6 and 7, and are cast with these walls, whereby the latter are stiffened and leakage is avoided. The upper sections C are preferably cast of iron, which material is best adapted to resist the abrading action of the sharp-cornered lumps of ore and flux with which the furnace is charged. The lower sections B are preferably cast of copper, which material is best adapted to resist the hot molten metal and gases, which act most intensely in the lower part of the furnace.

e represents openings formed in the contiguous plates of the upper and lower sections for establishing a communication between the water-spaces of the same. A packing *e'*, of rubber, asbestos, or other suitable material, is placed between the contiguous plates of the sections. The upper portions of the lower sections cover the lower portions of the upper sections and protect these lower portions from the heat, so that any sediment which may lodge in the lower portions of the upper sections is not subjected to excessive heat and the baking on of such sediment and the burning out of the upper sections at their lower ends are thereby avoided. A deposit of sediment in the lower portions of the upper sections is to a large extent avoided, because the lower ends of the upper sections are in communication with the upper ends of the lower sections, so that the sediment can freely

pass down from the upper sections into the lower sections and settle on the bottom of the latter below the furnace-bottom, where the sediment is not exposed to the full heat of the furnace.

F, Figs. 1, 3, 4, and 9, represents a main drain-pipe or manifold, which is arranged horizontally underneath the furnace-bottom and which is connected by branch pipes *f* with individual drain-pipes G, extending downwardly from the bottom of the lower sections. The main drain-pipe F is provided with a blow-off pipe H, having a valve or cock *h*. Each individual drain-pipe G connects with the corresponding branch pipe *f* by a stuffing-box *i*, which is arranged at one side of the individual drain-pipe G. The communication between each lower jacket and its drain-pipe G is controlled by a valve-plug K, which is seated in the lower portion of the drain-pipe and held in place by a removable screw-cap *k*. The plug, which is closed at the bottom, is cylindrical or slightly tapering, so that it can be turned in its seat and has an opening *k'* in its side which can be made to register with the branch pipe *f*. The lower end of the plug is provided with a depression *l*, Figs. 9 and 10, or is otherwise so shaped that a wrench can be engaged with the plug for turning it.

M represents a horizontal manifold or header which extends around the upper portion of the upper tier of jackets or sections and which communicates with each of them by a single short branch pipe *m*. The latter is so large in diameter that it affords free passage for the steam from the jacket to the header and for the water from the header to the jacket. The header is supplied with water through a pipe *n* from a reservoir or supply (not shown) in such a way that the water-level is maintained in the header at a certain height, preferably about at the top of the branch pipes *m*. The header has the form of a rectangular frame and surrounds the sections of the upper tier and is firmly secured to the same, whereby the upper portion of the furnace is braced and held securely in shape.

O represents vent-pipes which extend upwardly from the header and carry off the steam.

The main drain-pipe F may be provided with a water-inlet pipe G', which is controlled by a valve or cock *g'*, so that the jackets can be supplied with water from below, if desired. The valve *h* in the blow-off pipe H and the water-inlet valve *g'* in the pipe G' are normally closed. When it is desired to empty the jackets, the valve-plugs K and the blow-off valve are opened. The water and sediment are now discharged simultaneously from all the sections. If it is desired to empty only a particular section or if it is desired to ascertain whether a particular section is filled with sediment at the bottom, the valve-plug of this particular section only is opened. The flow of water from this section will then indicate to what extent it is obstructed by sediment. If it is desired to clean out a section by inserting a tool, this can be readily done after the water has been drawn off by removing the cap *k* and the valve-plug K.

The upper tier of sections is secured together near their lower ends by longitudinal side beams P, end beams Q, tie-rods R, and end clamps S, Figs. 1, 4, 5, and 11. The longitudinal beams P are arranged on the long sides of the furnace across the lower portions of the jackets of the upper tier, and the end beams Q are arranged across the sections at the ends of the furnace. Clamps S are secured to ends of the longitudinal tie-beams P and project over the outer side of the adjacent end of the end beam Q. Each clamp bears against the outer side of the adjacent end beam by a clamping-screw *s*, which presses the end beam against the end sections. A tie-rod R is arranged horizontally underneath each end beam and connects the two clamps S at the same end of the furnace. These side beams, end beams, clamps, and tie-rods secure the lower portion of the upper tier of sections firmly together in a very simple manner.

I claim as my invention—

1. In a furnace-stack, the combination of an upper and a lower water-jacket, the lower jacket overlapping with the upper portion of its water-space the lower portion of the water-space of the upper jacket on the inner side of the latter, whereby the lower portion of the upper portion is protected against the heat, and means for establishing a flow of water through the jackets, substantially as set forth.

2. In a furnace-stack, the combination of upper and lower water-jackets, the lower jackets overlapping with the upper portion of their water-spaces the lower portion of the water-spaces of the upper jackets on the inner sides of the latter, water-passages formed in the contiguous portions of the upper and lower jackets, fastenings whereby the contiguous portions of the upper and lower jackets are secured together, and means for establishing a flow of water through the jackets, substantially as set forth.

3. The combination with a furnace-stack composed of upright water-jackets arranged side by side, of a manifold drain-pipe arranged underneath the furnace-bottom, individual drain-pipes which extend from the bottom of each jacket downwardly to the manifold-pipe, and an inlet and outlet for the water, substantially as set forth.

4. The combination with a furnace-stack composed of upright water-jackets arranged side by side, of a manifold drain-pipe arranged underneath the furnace-bottom, individual drain-pipes which extend from the bottom of each jacket downwardly to said manifold-pipe, individual valves arranged in said individual pipes and whereby the communica-

tion of each jacket with said manifold is controlled, and an inlet and outlet for the water, substantially as set forth.

5. The combination of a furnace-stack composed of upright water-jackets arranged side by side, an individual drain-passage arranged at the bottom of each jacket, a valve-plug arranged in the end portion of said passage, a branch pipe which opens into the side of said drain-passage and is controlled by said valve-plug, a manifold drain-pipe which connects with the branch pipes from the jackets, and an inlet and outlet for the water, substantially as set forth.

6. The combination with a furnace-stack composed of upright water-jackets arranged side by side, an individual drain-pipe extending downwardly from the bottom of each section, a removable valve-plug arranged in the lower end of each individual drain-pipe, branch pipes which open into the sides of said drain-pipes and are controlled by side valve-plugs, a manifold drain-pipe which connects with said branch pipes, and an inlet and outlet for the water, substantially as set forth.

7. The combination with a furnace-stack composed of upright water-jackets arranged side by side, of a manifold-pipe arranged underneath the furnace-bottom, individual pipes which lead from the bottom of each jacket to said manifold-pipe, individual valves which control the individual pipes, a blow-off pipe connected with said manifold-pipe and controlled by a valve, and a water-inlet pipe which is connected with said manifold-pipe and controlled by a valve, substantially as set forth.

8. The combination with a furnace-stack composed of upright water-jackets arranged side by side, of side and end tie-beams arranged across the jackets at the sides and ends of the furnace, and clamps and tie-rods connecting said beams, substantially as set forth.

9. The combination with a furnace-stack composed of upright water-jackets arranged side by side, of side and end tie-beams arranged across the jackets at the sides and ends of the furnace, clamps secured to the ends of the side beams, clamping-screws arranged in said clamps and bearing against the end beams, and tie-rods arranged across the ends of the furnace and connecting the side beams, substantially as set forth.

Witness my hand this 29th day of January, 1901.

OLIVER S. GARRETSON.

Witnesses:
EDWARD WILHELM,
C. B. HORNBECK.