

**J. HARRISON.**  
**Furnaces for Melting Metals.**

No. 141,139.

Patented July 22, 1873.

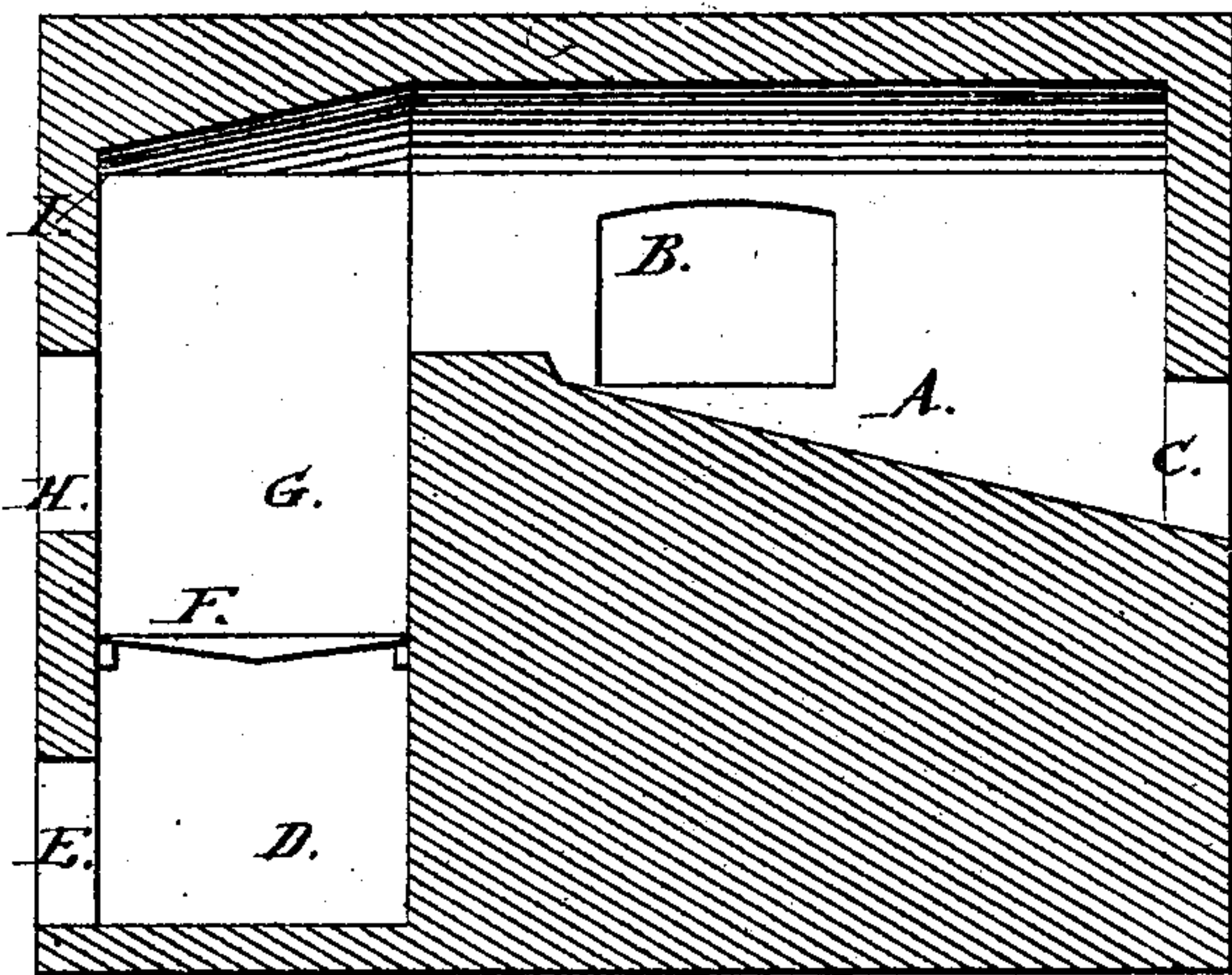


Fig. 1.

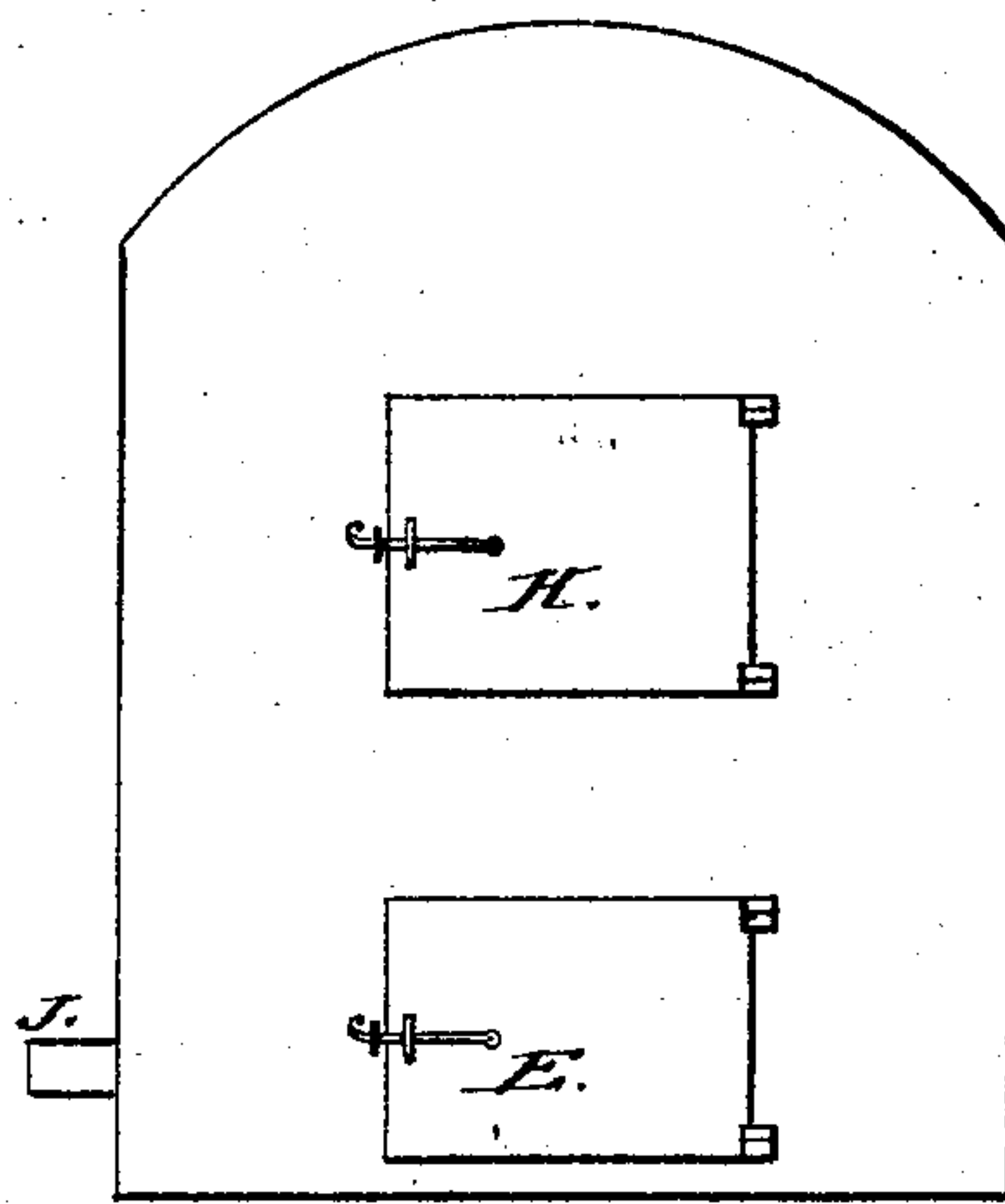


Fig. 2.

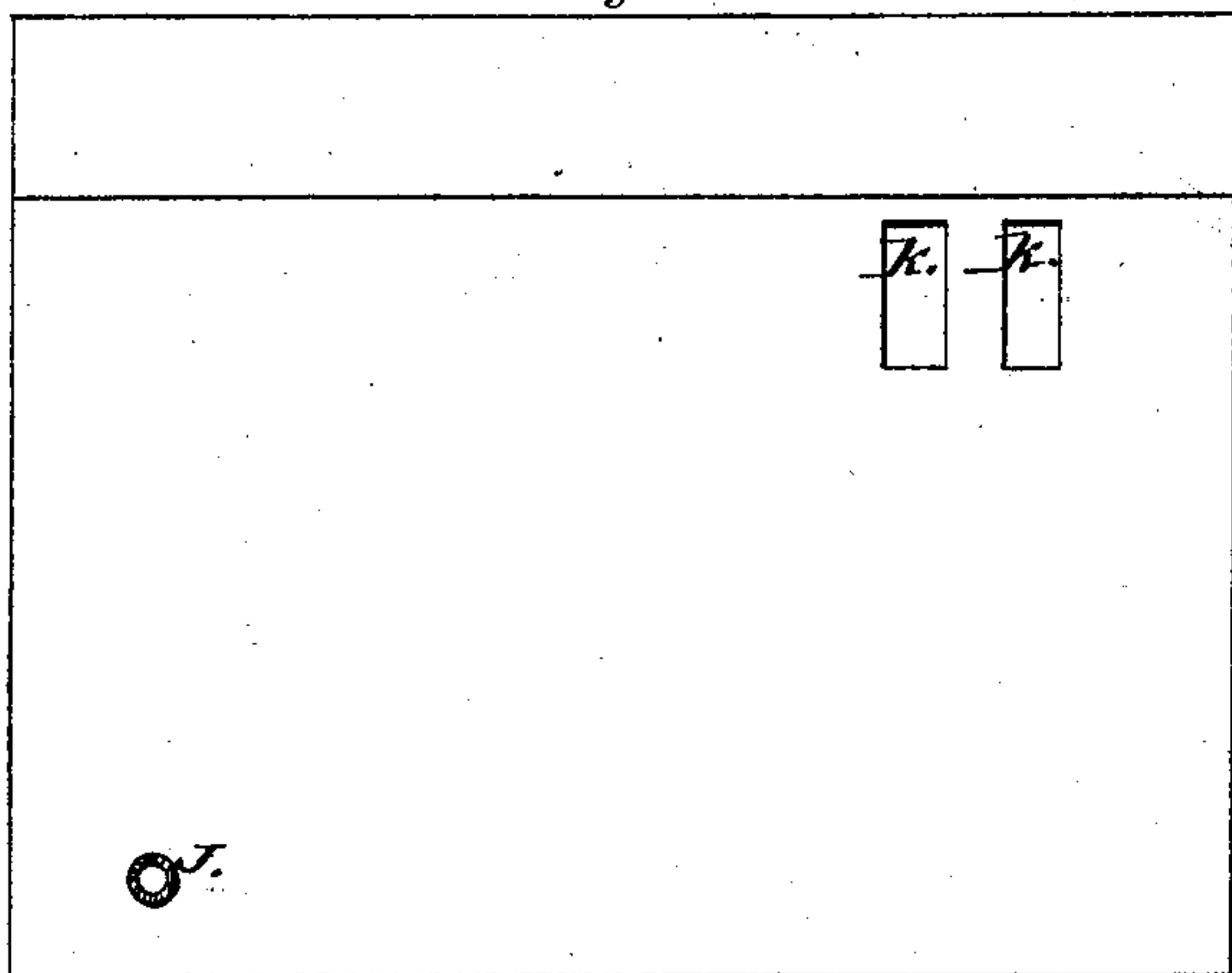


Fig. 3.

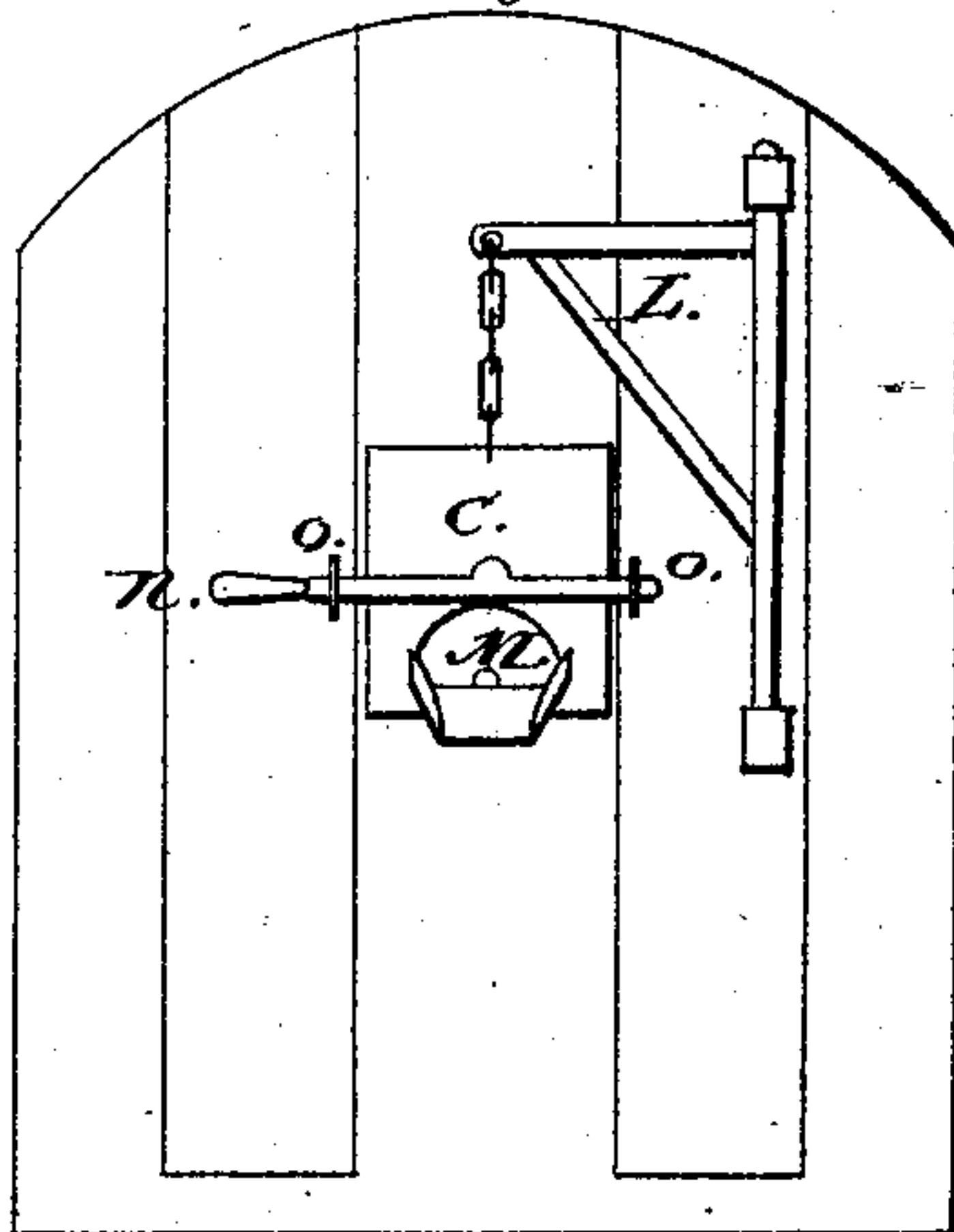


Fig. 4.

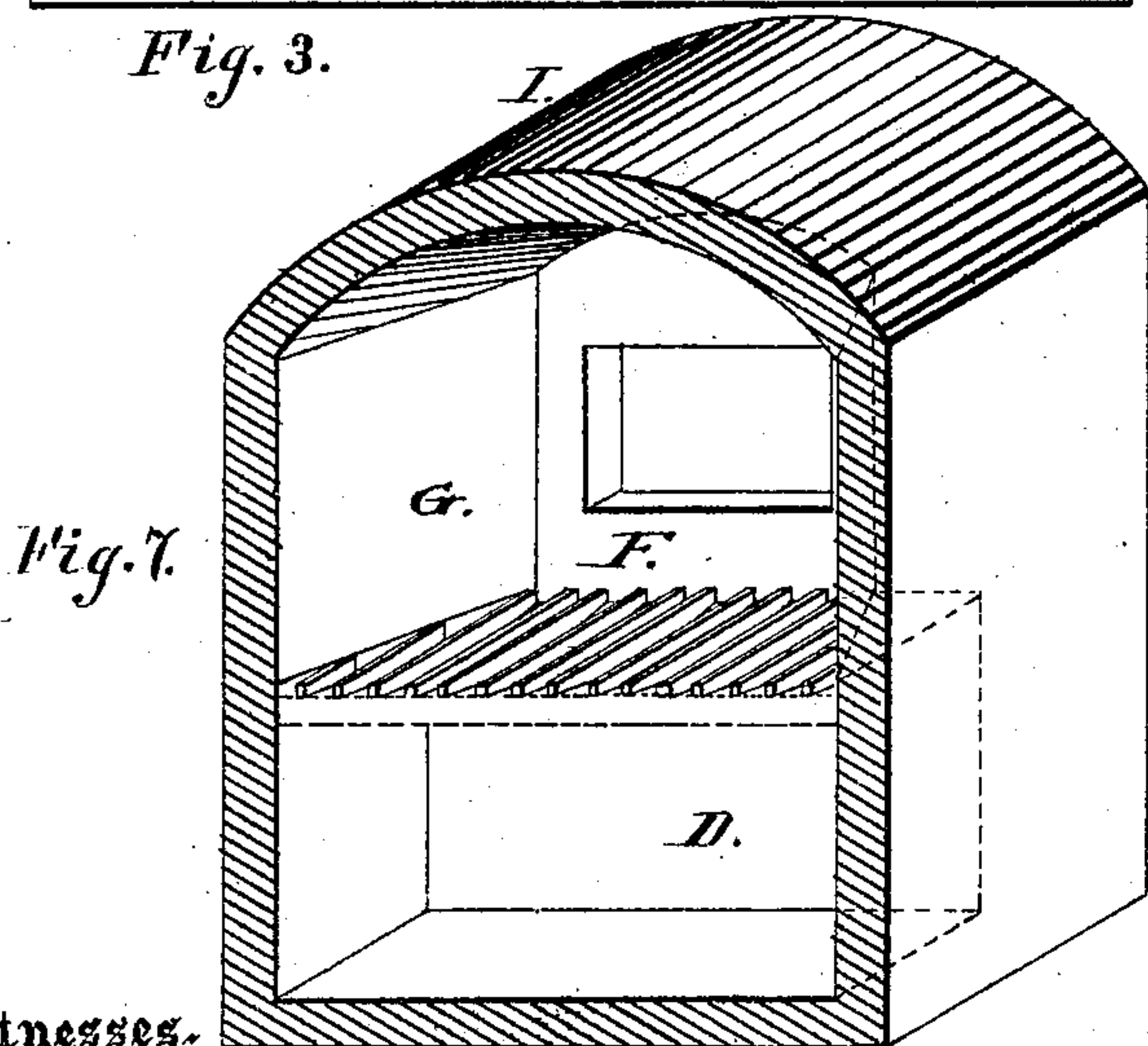


Fig. 7.

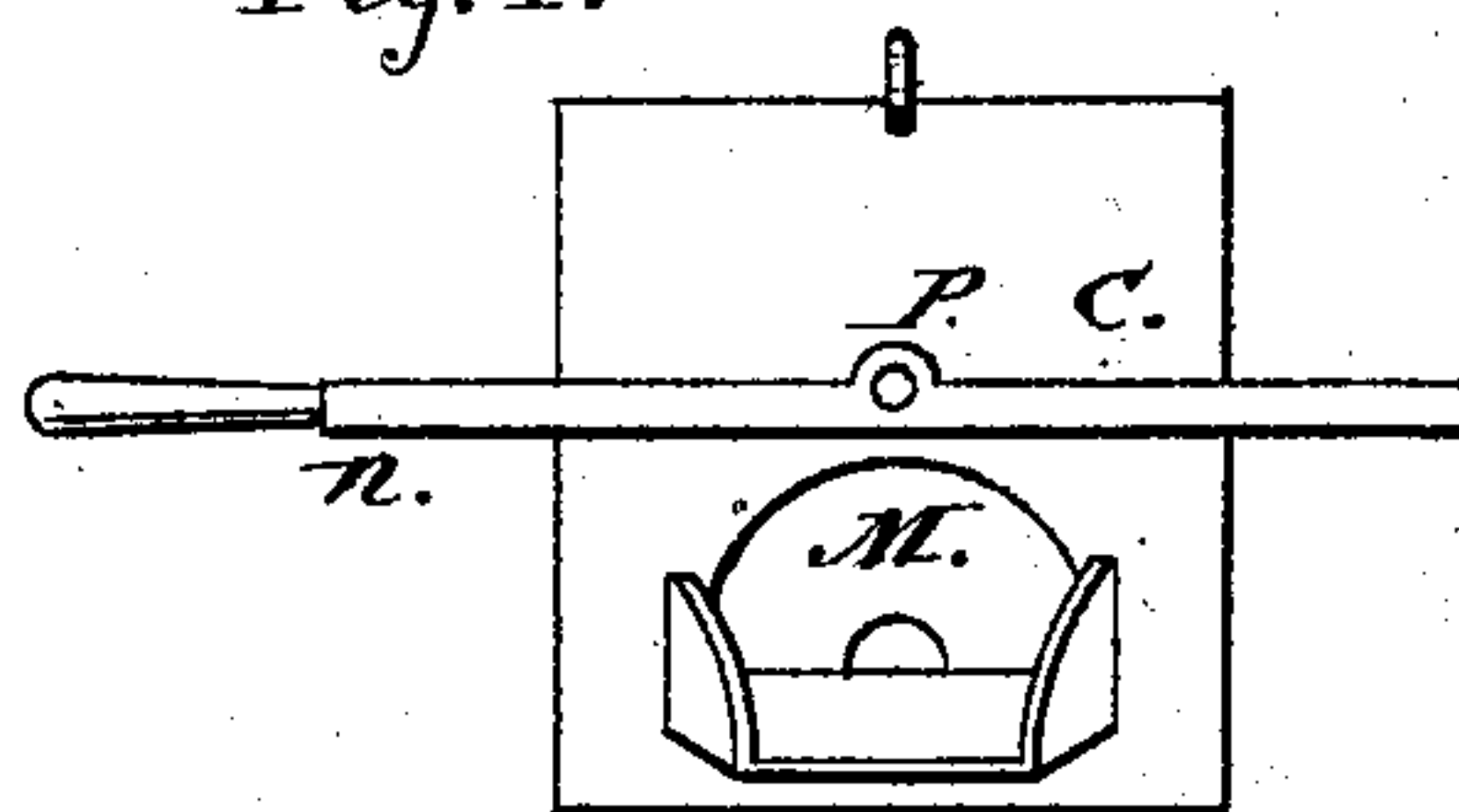


Fig. 5.

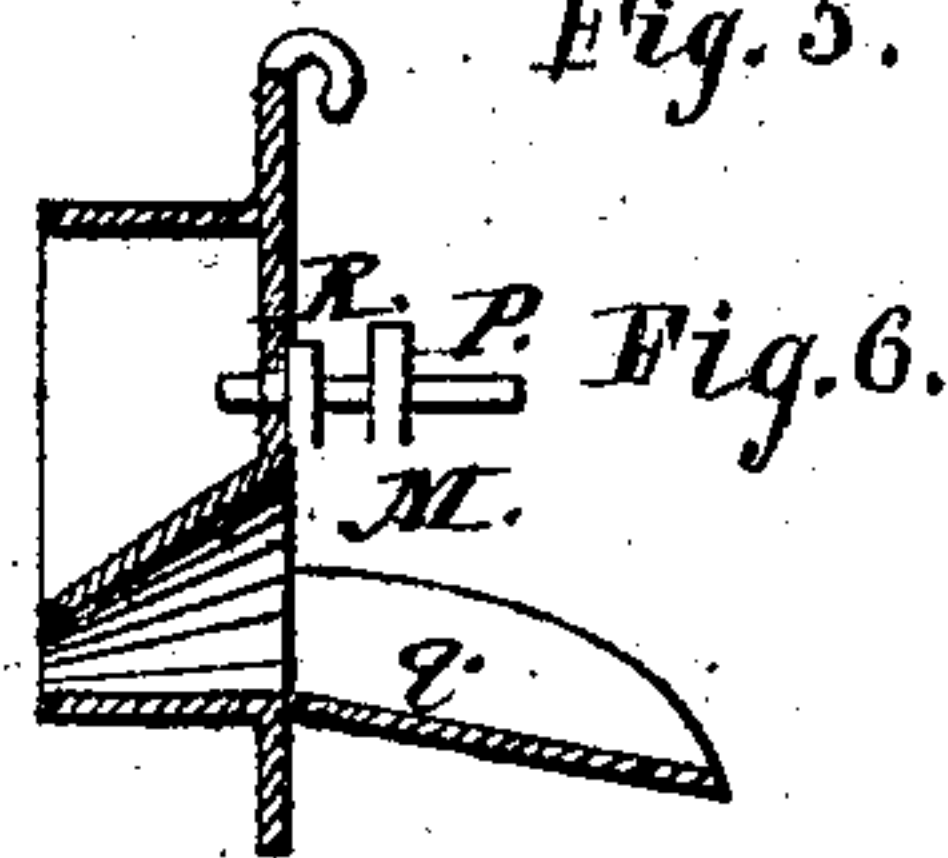


Fig. 6.

Witnesses.

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## IMPROVEMENT IN FURNACES FOR MELTING METALS.

Specification forming part of Letters Patent No. **141,139**, dated July 22, 1873; application filed February 20, 1873.

*To all whom it may concern :*

Be it known that I, JAMES HARRISON, of East Hampton, in the county of Middlesex, State of Connecticut, have invented a new and Improved Furnace for Melting Metals; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings making a part of this specification, in which—

Figure 1 is a perspective section of the furnace, showing the furnace-bed A, the feed-door B, the space for the metallic breast or front C, the ash-pit D, the space for the ash-pit door E, the grate-bar F, the fire-place G, the space for the fire-door H, and the funnel-shaped arch I over the fire-place G. Fig. 2 is a front view, showing the ash-pit door E, the fire-door H, and the blast-pipe connection J. Fig. 3 is a side view, showing the blast-pipe connection J and the draft-flues from the furnace to the chimney K K. Fig. 4 is an end view, showing the metallic breast or front C attached to the swing-crane L, and in its place in the furnace, also the half-funnel-shaped metallic tapping-hole M, and the screw stay-bar *n*, and the two catches *o o*. Fig. 5 is a front view of the metallic breast or front C, detached from the swing-crane L, showing the half-funnel-shaped metallic tapping-hole M, the screw stay-bar *n*, and the center screw-bolt P. Fig. 6 is a side view of the metallic breast or front C, showing the half-funnel-shaped metallic tapping-hole M, the center screw-bolt P, and the collar R, and spout *q*. Fig. 7 shows the ash-pit D, the grate-bars F, the fire-place G, and the funnel-shaped arch I.

The same letters are used to describe like parts, though given in different views.

The nature of my invention consists in the construction of the taper or funnel shaped fire-place, and the construction of the movable metallic breast or front, in which is a half-funnel-shaped metallic tapping-hole, and the devices necessary to operate the same, my object being to dispense with the use of crucibles in all ordinary brass foundings.

To enable others skilled in the art to make and use my invention, I will now describe its construction and operation.

In constructing my furnace I use the same

kind of material that is used in building hot-air furnaces generally, namely, fire-brick and fire-mortar. In Fig. 1 letter A represents the bed-pit of the furnace that holds the melted metal; letter B, the feed-door; letter C, the recess in which the metallic breast or front is placed; letter D, the ash-pit; letter E, the ash-pit door; letter F, the grate-bars; letter G, the fire-place; letter H, the fire-door; letter I, the fannel-shaped arch over the fire-place. Letters J, Figs. 2 and 3, are the blast-pipe connection. Letter K K, Fig. 3, are the flues that connect the furnace with the chimney. Letter L, Fig. 4, is the swing-crane that supports the metallic front when not in use in the furnace. Letter M is the half-funnel-shaped tapping-hole in the metallic front. Letter *n* is the screw stay-bar. Letters *o o* are the two catches that keep the stay-bar *n* in its place. Letter P is the center screw-bolt on which the stay-bar *n* works, and is kept in its place by the collar R. Letter *q* is the spout that conveys the melted metal from the furnace to the vessel that is prepared to receive it.

By referring to Figs. 1 and 7 it will be seen that the fire-place is much smaller at the fire-door than it is at the back, and that a gradual increase of width is maintained both on the sides and in the arch over the top, thus making it funnel-shaped. By this means I find the draft is increased very much, and the heat, as fast as generated, is drawn into the larger space that forms the furnace proper. I can melt more metal with less fuel, time, and labor than I have ever heard of being done before. The destruction of the fire-place by the fire is not so great in this furnace as in those where the funnel shape is not used.

In constructing the front of the furnace a hole is left about the middle of the front and a little below the bed of the furnace, as shown by letter C in Fig. 1. A breast-plate or front is then made to fit the hole thus left. This plate is made of metal or any suitable material. At the bottom of this plate or breast is a half-funnel-shaped tapping-hole, the larger circle being flush with the outside of the breast, and the small circle passing through the wall into the furnace. This will be understood by referring to Figs. 5 and 6 and to letters M. The screw-bolt P is put through



the center of the breast and kept in its place by the collar R, and is made to work with ease. The stay-bar *n* is put upon this bolt. By the side of this front is put up a small swing-crane, L, from which a small chain is attached to the breast, for the purpose of sustaining and swinging the breast out of the way when not required. On each side of the breast is a catch, *o o*; the recess of the one nearest the handle of stay-bar *n* is made on the upper side, and the recess in the other catch is made in the lower side, so as to allow the stay-bar to work in and out of the recesses, when required.

In operating this furnace, I first coat the bottom and sides of the furnace-bed A with a mixture of fire-clay and sand to fill up all the joints and cracks. I then put some of the same mixture on the four sides of the breast-plate C, and then put it into the hole in the front of the furnace, and then put the stay-bar into the recesses in the catches *o o*, and, by turning the screw P to the left hand, force the breast into the hole until it makes a close fit, and the mixture of clay and sand put around the breast fills up the joints, and makes it tight. The stay-bar is left in this position until the cast is over, to prevent the breast-plate from being forced out by the pressure of the metal against it on the inside of the furnace. I then put a little of the same sand and clay into the tapping-hole M to fill it up, and the furnace is ready for the fire. The fire is kindled in the fire-place. The blaze and smoke pass through the body of the furnace to the flues *k k*; then into the chimney. The metal is put into the furnace at the feed-door B, and as the flame passes over the metal it is melted, and it runs down to the lower part of the bed A, resting in part against the brick front, and in part against the breast-plate C. When there is a large quantity of metal to melt, and but little time to do it in, I can attach a blower or fan to the blast-pipe connection J, and close the ash-pit door E, and melt with the blast only; but for a small lot of metal, and where the blast cannot be had, I open the ash-pit door E and melt with air alone; so I can use this furnace either as a blast-furnace or an air-furnace, as circumstances may require. When the metal is ready to pour I take a small iron bar and make a small hole through the clay in the tapping-hole M, and let as much metal run into the ladle as I desire, and then stop up the hole again with some of the sand-and-clay mixture. This operation is repeated until all the metal is drawn out of the furnace.

It is sometimes the case that we have to "tap out" or draw metal from the furnace a hundred times before the cast is over, and it

is in this respect that my furnace differs from all other air-furnaces.

In all the air-furnaces heretofore made the tapping-hole is as long as the brick wall is thick—about twelve inches, or nearly so—and is usually made of sand; and after tapping out the first time, and stopping up the hole, while we use the metal we have got, the metal that was in the long tapping-hole when it was stopped up has set and become hard, and you cannot tap out again in the same place until the hard metal is forced back into the furnace, and the hammering necessary to force it back will break away the sand-made tapping-hole, and all the metal that is in the furnace will run out. It is not so with my furnace. My tapping-hole is made of metal, and is funnel-shaped, and at the nearest point to the melted metal is about one and a half inch, instead of twelve inches, and the clay-and-sand mixture can be forced into the tapping-hole thus far by the act of stopping up, thus making it impossible for the melted metal to get in and cool; consequently the operation of tapping out can be repeated all day, if necessary. When the metal is all drawn out of the furnace I turn the screw P to the right hand, while the stay-bar *n* remains in the catches *o o*, and by so doing I loosen and draw out the breast-plate C, and then, by relieving the stay-bar *n* from the catches *o o*, the crane L and the breast-plate C can be swung around to the side of the furnace, and out of the way. I then take an iron rake or hoe, and clean out all the slag from the furnace while it is in a molten condition. This saves the trouble of getting into the furnace when cold and chipping the slag off with a hammer and chisel, which is a very slow process.

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

1. The funnel-shaped metallic tapping-hole M with the breast C, substantially as and for the purpose described.

2. The combination of the screw-bolt P, collars R, and breast-plate C, substantially as described.

3. The combination of the breast-plate C with the stay-bar *n* and the screw-bolt P, substantially as described.

4. The combination of the swing-crane L with the breast-plate C, substantially as described.

5. The taper fire-place G, with the funnel-shaped arch I, in combination with a furnace, as and for the purpose specified.

JAMES HARRISON.

Witnesses:

WILLIAM H. HARRISON,  
CLARA P. HARRISON.