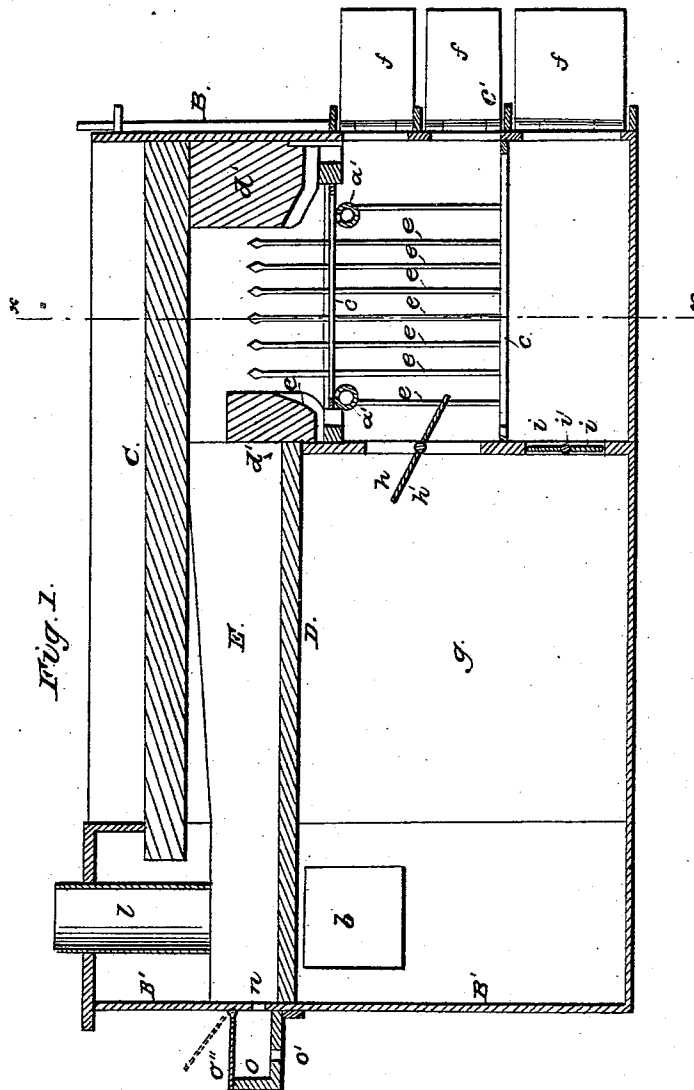


J. HEATLEY.

Furnace for Working Iron.

No. 82,313.

Patented Sept. 22, 1868.



Witnesses:
Thos. B. Kerr
R. C. Marshall

Inventor:
John Heatley
by Bakewell & Christy
his Attys

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Fig 3.

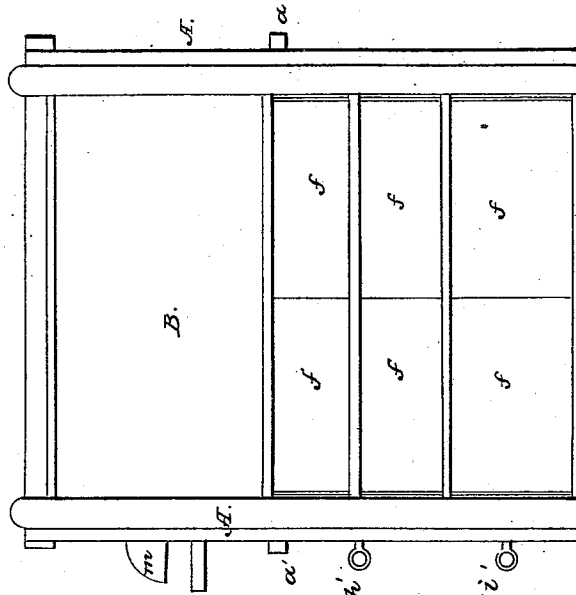
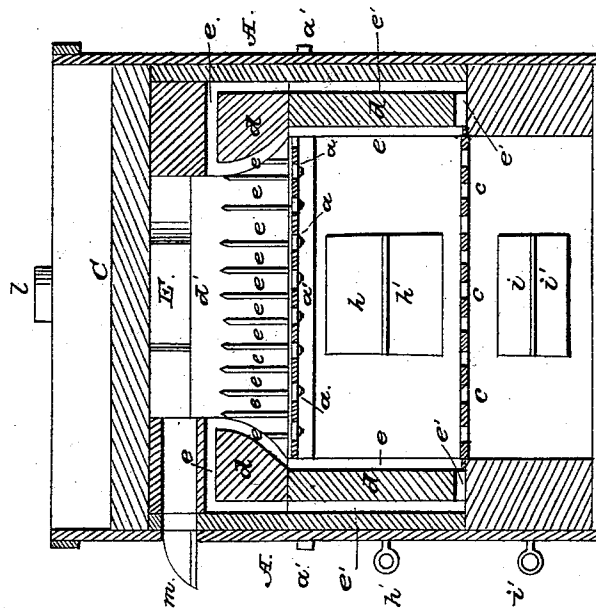


Fig 2.



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United States Patent Office.

JOHN HEATLEY, OF ETNA, PENNSYLVANIA.

Letters Patent No. 82,313, dated September 22, 1868.

IMPROVEMENT IN FURNACES FOR WORKING IRON.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JOHN HEATLEY, of Etna, in the county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in Furnaces; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, in two sheets, making a part of this specification, in which—

Figure 1 is a section formed by a vertical plane passing longitudinally through a heating-furnace fitted with my improvements.

Figure 2 is a vertical section passing transversely through the furnace proper, in the line *x x*, fig. 1; and Figure 3 is a front elevation of the furnace.

Like letters of reference indicate like parts in each.

My improvements are adapted more or less perfectly for all kinds of furnaces used for heating purposes, but are especially applicable to boiling, puddling, and "heating-furnaces;" and the nature of my invention consists—

First, in opening communication for the passage of air from at or near the rear of the furnace, along under the bottom plate, to the ash-pit and fire-space in the front.

Second, in the use and arrangement of dampers relatively to the air-chamber and fire, by which the heated air may be admitted into the fire at any desirable point.

Third, in introducing a perforated plate or finely-divided grate between the fire-grate and the bottom of the ash-pit to receive the hot ashes, through which to pass the air before it reaches the fire.

Fourth, in constructing, in the walls of the fire-space and ash-pit, a series of hot-air flues leading from below the fire-grate, and discharging into the fire above the grate; and

Fifth, in constructing a close fire-box at the tap-hole of the furnace.

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

A A represent the side walls of a common heating-furnace; B, the front, and B' the rear walls; C, the cover or arch, and D the bottom plate. *a* is a fire-grate, of the usual or any known construction, resting on tubular cross-bearers *a'*. Beneath is the ash-pit, which, however, is divided into two parts by another grate, *c*, with narrow openings between bars, or a finely-perforated plate may be substituted in lieu thereof, such grate or plate being pivoted at its sides, and held in a horizontal position by a catch or pin, *c'*, inserted under its heavier end, so that, while the grate or plate *c* is held up, it will retain the hot ashes which fall from above, and when tipped by withdrawing the pin *c'*, will discharge its load into the bottom of the ash-pit for greater convenience in cleaning.

The ash-pit and fire-space are surrounded by walls, or by a lining, *d d'*, in which are two or more series of flues *e e'*, one series, *e*, being in the face of the lining, and extending up to the fire above the grate *a*, and the other, *e'*, passing through the lining, and discharging into the fire above, at or near the upper part, where combustion of smoke and gases usually takes place. The front of the ash-pit is closed by the tight doors *f*, by which, if desired, all cold air is excluded from the fire.

At any convenient point in the rear part of the furnace is a door, *b*, opening into the chamber *g* under the bottom plate D, for the admission of air, which, coming in contact with the heated bottom plate D, is raised to a high temperature. In the front wall of the chamber *g* are two apertures with dampers *h* and *i*, which are opened and shut by the damper-rods *h'* *i'* respectively. The upper damper opens into the ash-pit above the lower grate *c*, and the other, *i'*, below it. By the use of these dampers, heated air is admitted from the chamber *g*, either above or below the lower grate *c*, as yet to be explained.

E is a place to be fitted up as a puddling or heating-furnace in the usual way. *l* is a smoke-stack, by which smoke, unconsumed gases, &c., from the fire on the grate *a* are to be carried off. *m* is the feed-hole for supplying the fire with fuel.

A fire being made in the grate *a*, the door *b* is opened and the doors *f* closed, the lower grate *c* being in the

position shown, and also one or both the dampers *h i* are opened. The hot ashes fall on the lower grate *c*, and retain their heat for a considerable time.

If only the upper damper, *h*, be open, the air from the chamber *g*, already somewhat heated, will go, a part of it, to support combustion on the grate *a*, but the larger part will spread out in the space between the two grates, and take up heat from the fire above and ashes beneath, and, being thus again heated, will pass up around the grate *a* in the flues *e*, and be fed into the fire, near its upper part, where combustion is and requires to be most active.

If only the lower damper *i* be open, the air, heated as before, will pass through the bed of loose, hot ashes on the lower grate *c*, effect the combustion of some gases and combustible elements therein, and so being heated to a higher temperature, will pass along not only the inner flues *e*, but also the outer flues *e'*, and be discharged into the fire, as above described.

If both dampers be open, the results will, of course, be combined. In any case the hot air thus introduced to the fire at the point of most vivid combustion, will largely promote the ignition of gases, smoke, &c., to consume which requires a plentiful supply of highly-heated oxygen. The heat thus evolved will pass over the lining-wall or fire-bridge *d'* in the rear of the fire-space, and perform the work desired. I thus gain not only an increased amount of heat, but do so by igniting gases which are apt to have a deleterious effect on the iron which is being worked.

By the use of the dampers *h i*, I regulate the quality of the heat as well as the quantity, reducing or increasing its temperature, so as to make it soft in its effect on the iron, or otherwise, at pleasure; the effect of different degrees of heat on the iron which is being worked being well known to those skilled in the art.

When it is desired to clean out the grate *a*, the upper doors *f* are opened for that purpose. In order to remove the ashes wholly, I draw out the pin *e'*, let the grate *c* tip or tilt forward, discharging the ashes in the bottom of the furnace, whence they are readily removed.

The bearers, *a'*, I usually make hollow, that the air inside may enable it to resist the destructive action of the fire outside. The air in the chamber *g*, by acting slightly as a chill on the bottom plate *D*, performs for it the same function, preserving it against injury from excessive heat, and rendering it far more durable.

The grate-bars *a* are preserved from destruction in the same manner. At the rear of the furnace is a tap-hole, *n*, and fire-box, *o*, with an air-aperture, *o'*, in the bottom for the admission of air to the fire, which is made in the fire-box *o*, or the bottom of the box *o* may be an ordinary fire-grate.

This box I close on top by a cover, *o''*. Usually in such furnaces the tap-hole is left open, and the cold air passing in, lessens the force of the draught in the smoke-stack, as well as cuts away the lining. By the use of a box closed on top, and with a fire inside, I wholly obviate these difficulties, and at the same time leave an open tap-hole, *n*, and aperture, *o'*, through which to draw off the cinder, &c., as is usually done.

Thus, without increasing at all the size or expense, or materially altering the shape or mode of construction, I make a furnace more efficient in its action than the ordinary furnace, more durable, one which will more perfectly utilize all heat generated, and generate more from a given amount of fuel, and which will produce superior effects in working, puddling, or boiling iron, or in any other process to which it may be applied.

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

1. An air-chamber, *g*, under the bottom plate of a heating or puddling or boiling-furnace, provided with such communications as to receive air from without, heat it, and discharge it into the furnace, fire-space, or ash-pit, substantially as and for the purposes hereinbefore set forth.

2. The use of two or more dampers, *h i*, so arranged, relatively to the air-chamber *g* and lower grate *c*, as to admit heated air either above or below such grate *c*, or both above and below, substantially as and for the purposes above expressed.

3. A perforated plate or finely-divided grate, *c*, at any desirable point below the fire-grate *a*, and above the bottom of the ash-pit, arranged and used substantially as and for the purposes hereinbefore set forth.

4. The series of flues *e e'* extending along the face of or through the lining or walls of a heating, puddling, or boiling-furnace, arranged and used substantially as and for the purposes described.

5. A fire-box, *o*, covering the tap-hole *n* of a furnace, constructed and operated substantially in the manner and for the purposes hereinbefore set forth.

In testimony whereof, I, the said JOHN HEATLEY, have hereunto set my hand.

JOHN HEATLEY.

Witnesses:

B. C. CHRISTY,

G. H. CHRISTY.