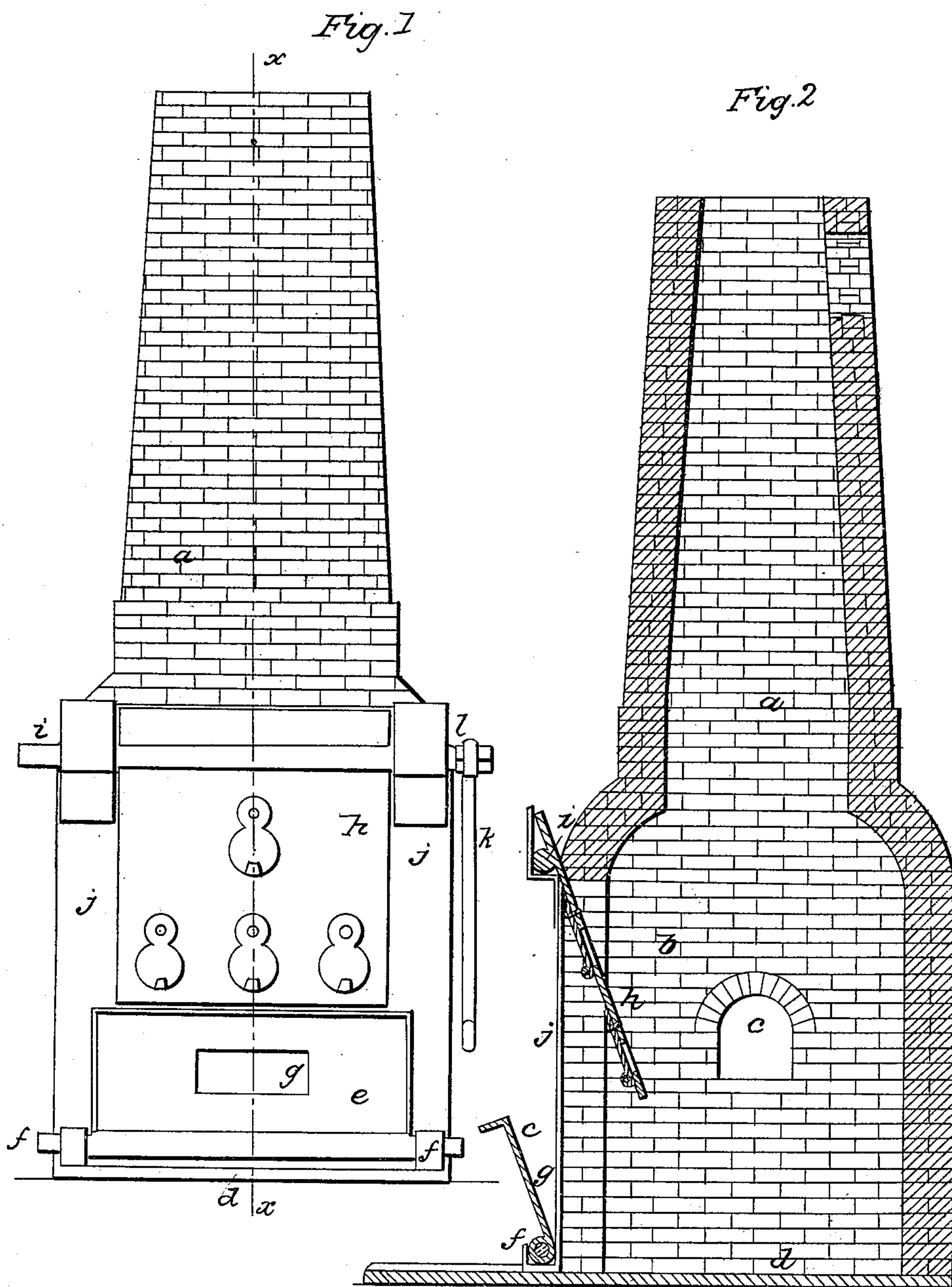


RENTON & CRANE.
Making Malleable Iron Direct.

No. 5,702.

Patented Aug. 10, 1848.



UNITED STATES PATENT OFFICE.

JAS. RENTON AND JAS. H. CRANE, OF NEWARK, NEW JERSEY.

IMPROVEMENT IN THE CLOSED BLOOMERY-FIRE.

Specification forming part of Letters Patent No. 5,702, dated August 10, 1848.

to all whom it may concern:

Be it known that we, JAMES RENTON and JAMES H. CRANE, of Newark, in the county of Essex and State of New Jersey, have invented new and useful improvements in the furnace or apparatus for the manufacture of malleable iron directly from the ore; and we do hereby declare that the following is a full, clear, and exact description of the principle or character which distinguishes them from all other things before known, and of the manner of making, constructing, and using the same, reference being had to the accompanying drawings, making part of this specification, in which—

Figure 1 is a front elevation of the furnace; and Fig. 2 a vertical section thereof, taken at the line X X of Fig. 1.

The same letters indicate like parts in all the figures.

Our improvements relate to and are based on the furnace patented by Alexander Dickerson on the 13th of March, 1847, for manufacturing malleable iron directly from the ore, in which is combined a chamber for containing the charge of ore, &c., with the closed forge placed below, in which the loop of malleable iron is formed. In the furnace invented by the said Dickerson, when a loop is to be removed from the forge, the charge in the stack or upper chamber has to be burned out or sustained by the insertion of bars or slides through the lower part of the stack, and when the loop has been removed the stack must be recharged, or these bars withdrawn to let down the charge into the lower chamber or forge before proceeding with the operation. This occasions inconvenience, for after the bars have been inserted the ore in that part of the charge which lies below the bars, being insufficient for the fuel, is converted into iron before the fuel is consumed, which heats the loop to a temperature too high before it can be removed, thus causing delay and waste of fuel, and finally when the sustaining-bars are withdrawn the whole charge falls down, by gravity, a distance of several feet onto the hearth, and the ore and partly-fused metal, being of greater specific gravity than the coal, descends first, thus deranging the proper proportions of ore and coal. The inconveniences arising from the use of the bars or slides for

sustaining the charge of ore, &c., in the stack during the operation of removing the loop from the forge have occasioned the disuse of them, so that the stack is only charged with an amount of ore, &c., requisite for the formation of one loop. Thus all the advantages that would be due to a continuous operation are lost.

The object of our invention is to remedy these evils, and the nature thereof consists in combining with a furnace or other apparatus constituted for the purpose of smelting ore, &c., a large door (which we term a "cut-off") hinged at its upper edge to the lower end of the stack, or thereabout, so that the lower edge of the said door or flap shall open inward, and by compressing the fuel, &c., above sustain the main part of the charge on its inclined inner surface, and thus admit of removing the formed loop without first burning down the entire charge in the stack, the charge above remaining in a heated state prepared for an immediate continuation of the operation so soon as the loop has been removed and the cut-off door or flap closed.

Our invention also consists in making the fore plate movable, that the loop may be removed from the forge with more facility after it has been formed, whether this be used in combination with the cut-off or flap or without it.

In the accompanying drawings, *a* represents a furnace-stack to be constructed in manner similar to any of the furnaces for smelting iron; but instead of having the lower part, *b*, thereof made as smelting-furnaces have been heretofore, it is formed in manner similar to the closed forge, or in any other manner desired for the purpose of forming the loop of malleable iron. The tuyeres for the introduction of the blast to the charge in the stack are inserted at *c* in the lower chamber or forge, *b*, at such height from the hearth *d* of the forge as to discharge the blast above the loop, as in the ordinary forge. The front of the lower chamber is made open, with two hinged flaps or doors, that when closed shut it up tight. The lower one, *e*, which is thus constituted a movable fore plate, has trunnions or journals *ff* at the lower edge, which turn in appropriate boxes on the hearth, so that when this door or flap is opened outward the loop, cinder, &c., can be drawn out with facility; but it is pro-

vided with a small door, *g*, for the usual purposes except removing the loop, and the other flap or cut-off door, *h*, is provided with journals *i i* at its upper end, which turn in open boxes to admit of removing it when desired. It is also provided with apertures covered with slides to admit proper instruments to ascertain the condition and temper of the loop. It is prevented from opening outward by fillets *j j*, or by any other means, so that the weight of the charge within shall keep it closed; but it opens inward by the application of a lever, *k*, to the end of the journals, or by the application of any other mechanical power applied to the journals or to the face of the door, and as its lower edge extends down to the lower door or movable fore plate when it is opened inward the charge within the stack is compressed, and is thus sustained on its inner surface, which forms an inclined plane that that part of the charge which is back of the edge of this inclined plane may continue entirely down and rest on the hearth. In this way access is given to the loop, the particles of iron, cinder, &c., are prevented from falling down from the charge above onto it, and at the same time the operation in the stack continues at a moderate rate, and, in fact, if desired, additional tuyeres may be placed above the flap or cut-off for the purpose of continuing the smelt-

ing process in the stack while removing the loop from the forge. The movable or hinged fore plate can be operated by a lever in manner similar to the hinged door or cut-off. With these improvements the furnace can be kept constantly and uniformly charged. We do not wish to confine ourselves to the making the movable front or cut-off and the movable fore plate with hinges, although we deem that the best mode of applying them.

What we claim as our invention, and desire to secure by Letters Patent, is—

1. The employment of the movable front or cut-off which opens inward to sustain a great part of the charge in the stack during the operation of removing the loop, substantially as described, when this is combined with a furnace for smelting or reducing ore, consisting of the stack for smelting the ore, and the closed forge for forming the loop of metal, substantially as described.

2. The movable fore plate for the purpose and in the manner substantially as described, and this we claim also in combination with the movable front or cut-off, as described.

JAS. RENTON.

JAMES H. CRANE.

Witnesses:

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