I. M. PHELPS.

Refining Iron and Steel.

No. 145,680. Patented Dec. 16, 1873.

Fig. 1.

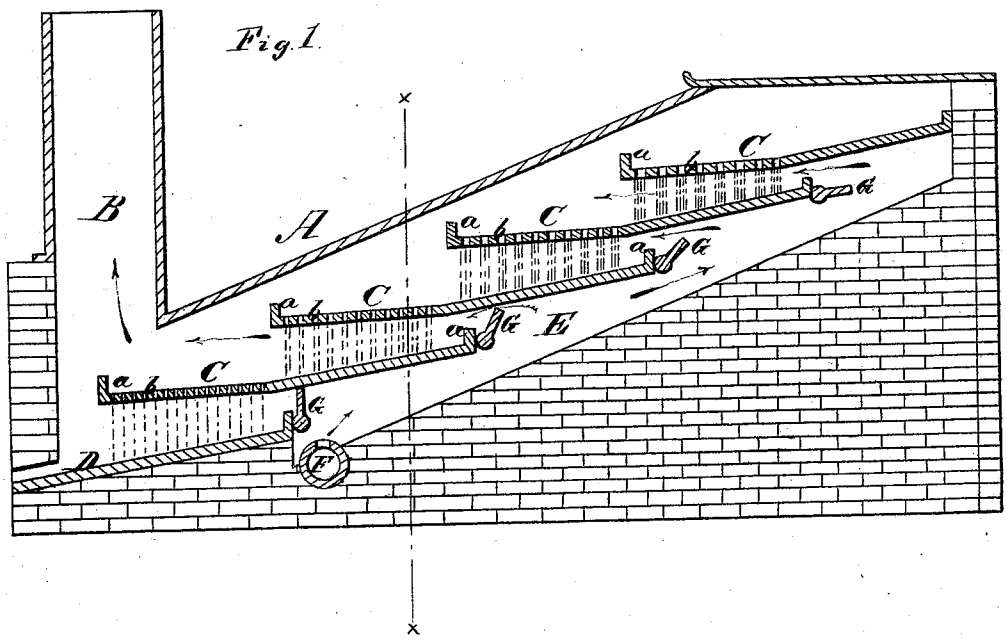
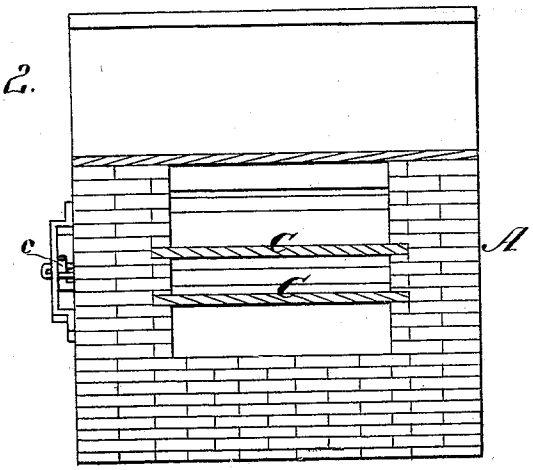


Fig. 2.



WITNESSES

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IRA M. PHELPS, OF PHILADELPHIA, PENNSYLVANIA.

IMPROVEMENT IN REFINING IRON AND STEEL.

Specification forming part of Letters Patent No. **145,680**, dated December 16, 1873; application filed November 29, 1873.

To all whom it may concern:

Be it known that I, IRA M. PHELPS, of Philadelphia, in the county of Philadelphia and State of Pennsylvania, have invented a new and valuable Improvement in Refiners; 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, and to the letters and figures of reference marked thereon.

Figure 1 of the drawings is a representation of a longitudinal section of my refiner. Fig. 2 is a transverse section of the same.

This invention has relation to the purification of metallic ores, or of pig-iron, and to the conversion of iron into steel, by subjecting the same to the action of atmospheric air.

My invention consists, essentially, in a series of graduated perforated tablets or tiles, which are so arranged that the melted metal percolating through one tile will be received upon a succeeding lower one, and so on to the foot of the series, where it may be discharged into molds or other suitable receptacle, in combination with blasts of atmospheric air, which are forced through the falling streams of metal between the tiles, as will be hereinafter explained.

The following is a description of my refiner:

In the annexed drawings, A represents an inclined refining-furnace, which communinates at its highest end with a suitable melting-furnace, and which has a draft-pipe or chimney, B, rising from its lower end. C C C represent a series of tablets or tiles, which may be made of fire-clay, asbestus, and silica, or other refractory substances, well tamped or pressed, so as to become very firm and hard. These tiles are provided with flanges *a*, to prevent the melted metal from flowing over their edges, and they are arranged one below the other, as shown in Fig. 1. The tiles are perforated, as shown at *b*, the holes through the first or highest tile being the largest, and are smaller and more numerous through each succeeding lower tile in the series. D represents the lowest tile, which is not perforated, and from which the metal is drawn off into molds or other suitable receptacles. E represents a chamber below all of the perforated tiles, into which air is introduced through a pipe, F. G G represent valves, which are applied between the tiles, and which can be adjusted by their arms *c*, arranged outside of the refiner, and provided with suitable fastenings for fixing the valves after adjusting them.

In operating my refiner, air is blown through pipe F into the chamber E, from which chamber it passes in regulated quantities between the falling streams of melted metal to and through the chimney B, as indicated by the arrows. The uppermost tablet A receives the melted metal directly from the tap-hole of the furnace, and discharges it through the perforations through its lower half on the imperforated part of the succeeding lower tile. The metal thus flows from one tile to another until it reaches the lowest imperforated tile. The metal is thus divided into numerous streams, thereby thoroughly exposing it to the air and causing it to give up a portion of its carbon, silicon, and other oxidizable impurities, which are burned while in suspension, which operation is frequently repeated, each time exposing a greater amount of surface of the metal as the quantity of carbon and other impurities become less. I thus avoid a too great elevation of temperature consequent upon the rapid combustion of the impurities.

By means of the valves or dampers G, the air can be cut off entirely from the lower tablets, A, and so regulated in the upper ones as to produce cast-iron only partially decarbonized, or, as in making steel, the supply of air can be so great as will burn out all or nearly all of the carbon and other impurities.

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

1. In an iron-refiner, a series of perforated tablets, C, the perforations through which gradually diminish in size, but increase in

number from the highest to the lowest tablet of the series, in combination with an air-blast, substantially as described.

2. The combination, in a refiner, of an air-chamber, E, valves or dampers G, and a series of perforated tablets, substantially as described.

In testimony that I claim the above I have hereunto subscribed my name in the presence of two witnesses.

IRA M. PHELPS.

Witnesses:

ADOLPH OHL,

CHARLES W. MATTHEWS.