

JOHN F. BENNETT.

Improvement in Process for Purifying Iron, Steel, and other Metals.

No. 127,953.

Patented June 18, 1872.

Fig. 1.

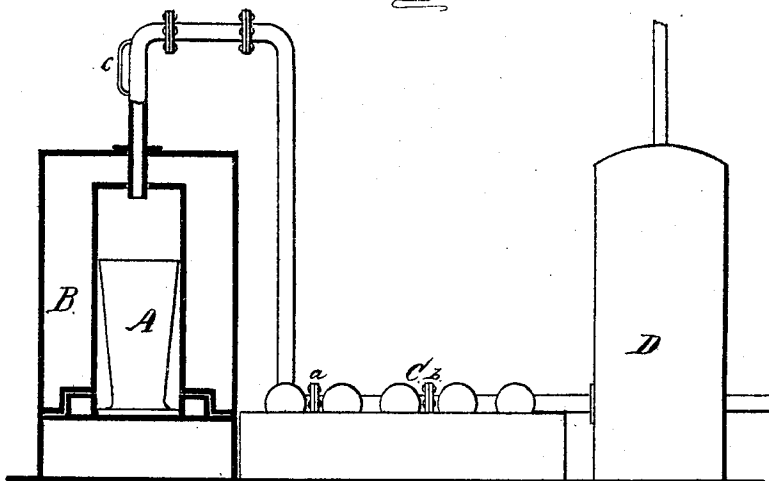
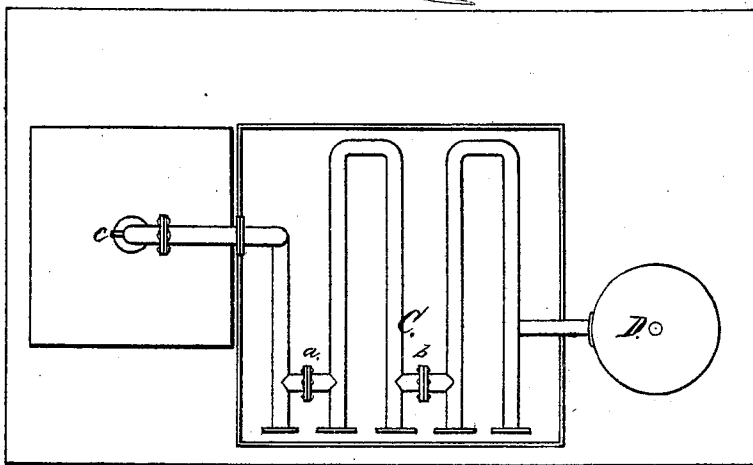


Fig. 2.



Witnesses.

M. Gardner.
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UNITED STATES PATENT OFFICE.

JOHN F. BENNETT, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN PROCESSES FOR PURIFYING IRON, STEEL, AND OTHER METALS.

Specification forming part of Letters Patent No. 127,953, dated June 18, 1872.

SPECIFICATION.

To all whom it may concern:

Be it known that I, JOHN F. BENNETT, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have discovered a new and useful Improvement in the Refining or Purifying of Iron, Steel, Glass, and metals generally; and I do hereby declare the following to be a full, clear, and exact description of the same.

In working and utilizing metals great difficulty is experienced in eliminating sulphur, phosphorus, carbon, and other impurities, so intimately or closely do they unite with the metals, either chemically or mechanically, or both. Such impurities may exist in the metal as it comes from the mine, or may be taken up from the agents employed in roasting, calcining, or smelting, or they may be absorbed directly from the atmosphere, especially in the cupola or furnace where the entire atmosphere which comes in contact with the molten metal consists wholly or chiefly of the gases of carbonic acid, nitrogen, &c. The process of absorption then goes on more rapidly, and the metal becomes more or less completely saturated with the deleterious substances referred to. Such impurities are believed to be injurious to the metals in which they exist; and it is also believed that to them are due the qualities known as "red-short," "cold-short," &c.

To enable others skilled in the art to make use of my discovery for practical purposes, I will proceed to describe the same, referring for that purpose to the accompanying drawing making a part of this specification, in which—

Figure 1 is a vertical sectional elevation, illustrating the construction of suitable apparatus for working my improvement, and Fig. 2 is a plan view thereof.

Like letters of reference indicate like parts of each.

The metal to be operated on, either previously melted or brought therein to a liquid state by the use of suitable known means, is placed in a crucible or other suitable receptacle, A, and is placed under or within an air-tight receiver, B. A pipe leads from the space occupied by the crucible A over to a vacuum condenser, C, which in turn is connected with the exhausting-chamber of an air-pump, D. A vacuum-gauge of suitable form is attached, as

at e, and the joints *a b* are fitted with taps for convenient construction.

The connection being open from the crucible to the air-pump, the latter is put in operation with the result of exhausting the air from the crucible. By the melting of the metal the solid, liquid, or gaseous impurities therein will be brought to so free a condition that the exhaustion of the air from the surface of the molten metal will, as approach is made to a perfect vacuum, so far relieve the pressure, which facilitates a cohesive union between the metal and its gaseous impurities, as that such union will be practically overcome, and the gases of phosphorus, sulphur, carbonic acid, and other deleterious substances will be removed or exhausted off from the entire mass, drawn over and condensed. By thus subjecting the mass of metal while in a molten state to the action of a vacuum, perfect or nearly so, such metal can be rendered perfectly pure or approximately so, and then it is, with or without other treatment, ready for casting or other use for which it is designed.

The same operation can be advantageously applied to the purification of glass and of slag or cinder given off in the smelting, boiling, puddling, heating, or calcining of such metals as are subjected to any of such or other like operations. Such cinder may then be reworked in the usual or other known way; and, in some cases, the amount of such impurities is so great that the product of condensation may be of value, especially where phosphorus is present in considerable quantities. Hence, by the operation described, I am enabled to secure not only a higher degree of purity in the metals themselves, but also to utilize the waste scoriae slag and cinder, as well as the substances which, entering so largely into their composition, have heretofore prevented their practical use in the arts.

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

1. As a mode of effecting the purification of glass, metals, metallic oxides, and metalloids, subjecting them while in a molten state to the action of a vacuum so as to eliminate the deleterious gases from their mass, substantially as set forth.

2. The mode of effecting the purification and utilization of the slag, cinder, or scoriae given

off in the smelting or working of metals and metalloids by eliminating therefrom, while fluid and in vacuo, their deleterious gases, substantially as described.

3. Utilizing the otherwise waste gas or gases contained in glass, metals, metallic oxides, and metalloids by bringing the same to a molten

condition and while in that condition exhausting out and condensing such gas or gases, substantially as described.

JOHN F. BENNETT.

Witnesses:

WM. B. NEEPER,
GEORGE PITFIELD.