J. R. Morris,

2 Sheets, Sheet 1.

Refining Iron & Steel.

No. 113,191. Patented Mar. 28, 1871.

Fig. 1

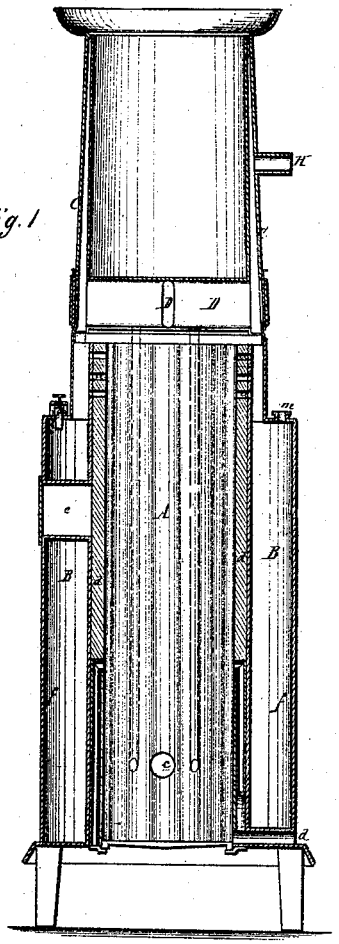


Fig. 2

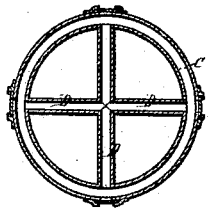
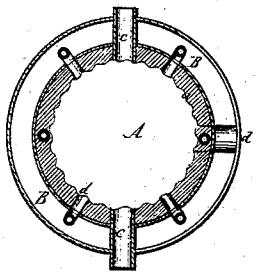


Fig. 3



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2 Sheets, Sheet 2

J. R. Morris,

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Fig. 4.

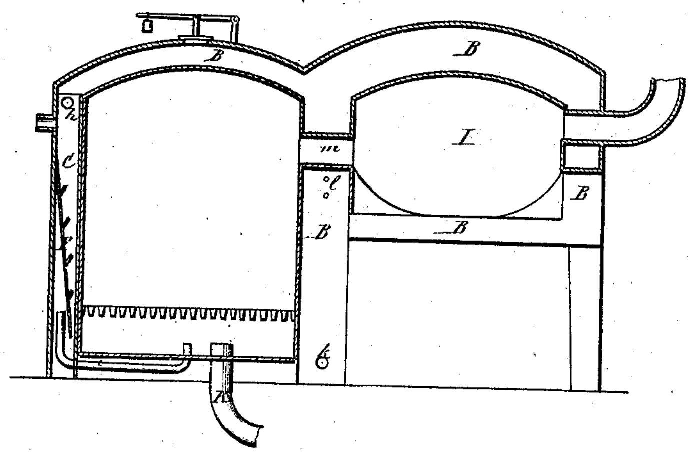
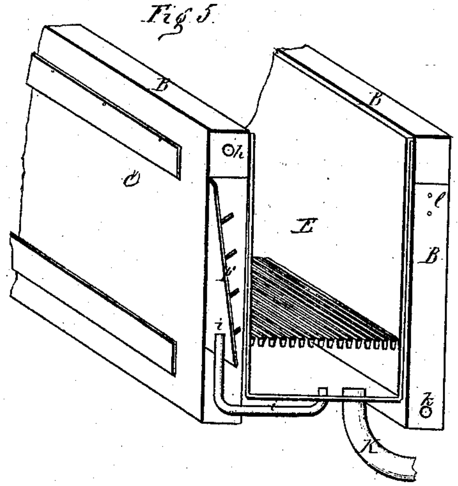


Fig. 5.



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UNITED STATES PATENT OFFICE.

JOSEPH R. MORRIS, OF HOUSTON, TEXAS.

IMPROVEMENT IN FURNACES FOR PRODUCING HYDROGEN AND TREATING ORES.

Specification forming part of Letters Patent No. **113,191**, dated March 28, 1871.

To all whom it may concern:

Be it known that I, JOSEPH R. MORRIS, of Houston, in the county of Harris and State of Texas, have invented a new and Improved Oxyhydrogen Cupola or Furnace; and I do hereby declare the following to be a full, clear, and exact description of the same, reference being had to the accompanying drawings, making a part of this specification, in which—

Figure 1 is a sectional elevation of a cupola. Figs. 2 and 3 are transverse sections of the same. Fig. 4 is a perspective section of a heating-furnace with my improvements applied, and Fig. 5 is a sectional elevation of a smelting-furnace.

This invention is an improvement on that for which Patent No. 101,956 was granted me the 12th of April, 1870.

The invention relates to a cupola or furnace in which a water-chamber more or less completely incloses the fire-chamber and absorbs therefrom all the heat that would otherwise be wasted, by which absorption of heat steam is generated in the water-chamber, whence it rises into a steam-chamber inclosing the fire-chamber above the water-chamber, in which upper chamber the steam is superheated, and from which its own pressure forces it, by the only outlet afforded it, through vessels loosely filled with iron scraps or filings, said vessels being placed either within or next to the fire-chamber, and their iron contents being consequently heated to redness, so that the contact of superheated steam therewith results in decomposition of the latter into oxygen and hydrogen, the former of which, uniting with the iron, forms oxide of iron—a merchantable article—while the hydrogen rushes into the fire-chamber, mingles with the ignited fuel therein, and not only burns, thereby increasing the amount of heat, but also attacks and drives off the impurities in the iron and coal, each cupola or furnace, be it observed, being itself the source of the heat which, in the manner above indicated, supplies it with hydrogen.

Referring to the drawings, A is a cupola; B, the inclosing water-chamber; C, the upper inclosing steam-chamber, communicating at its lower end with the water-chamber; D, the vessels that hold iron-filings and are placed within the cupola, communicating at their ends with the steam-chamber.

a are pipes opening out of the steam-chamber below the vessels D, passing downward through the lining *b* of the cupola, and opening at their lower ends into the cupola at the same height with the tuyeres *c*. The pipes *a* conduct the hydrogen that issues out of the vessels D, and this gas becomes additionally heated and expanded during its passage through said pipes, so as to be in a better condition for doing its work on the coal and iron or other metal when it reaches them.

The boshes are seen at *d*, the charging-orifice at *e*, and pipes for conducting external air at *f*. The pipes *f* open into the cupola at points where the oxygen furnished by the tuyeres is nearly exhausted, and where a fresh supply is consequently needed.

A safety-valve is shown at *g*.

H is a pipe, which may be used for discharging the exhaust-steam of an engine into the chamber C.

In Fig. 4, E is a heating-furnace, having an external water-chamber, B, at front, back, and one side, and a steam-chamber, C, at the other side, the latter having an orifice, *h*, near each upper corner for the admission of steam from the upper parts of the water-chamber.

F is a plate running the whole length of the steam-chamber, said plate being secured to the outer wall of the water-chamber at its upper edge, and being held at an interval from the front wall at its lower edge. The plate F supports the iron-filings, and the current of hydrogen issues from the lower side of the mass, and, passing under the plate F, enters a pipe, *i*, by which it is conducted into the fire-chamber, and is discharged either under or over the grate.

The inlet for water is seen at *k* and the try-cock at *l*.

Fig. 5 shows the same arrangement as Fig. 4, with the exception that a puddling-furnace, I, is attached to one side of the fire-chamber E, and communicates therewith by means of a passage, *m*, through which passes flame from the fire-chamber.

K is a pipe, which conducts a blast of air from a fan-blower to the fire.

L is the pipe by which products of combustion escape from the puddling-furnace.

Having thus described my invention, what I claim as new, and desire to secure by Letters Patent, is—

A cupola or furnace combined with a water-

chamber, a steam-chamber, and converting-vessels, or a converting-chamber containing iron filings or scraps, said furnace being so placed with reference to the other chambers as to heat the water in one and the iron in another and superheat the steam in the third, and the converting-chamber being so placed with reference to the steam-chamber as to receive steam therefrom, and with reference to the furnace as to discharge hydrogen thereinto.

JOSEPH R. MORRIS.

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