4 Sheets—Sheet 1.

J. PLAYER.

Manufacture of Balls, Blooms, and Slabs of Malleable Iron.

No. 77,210. Patented April 28, 1868.

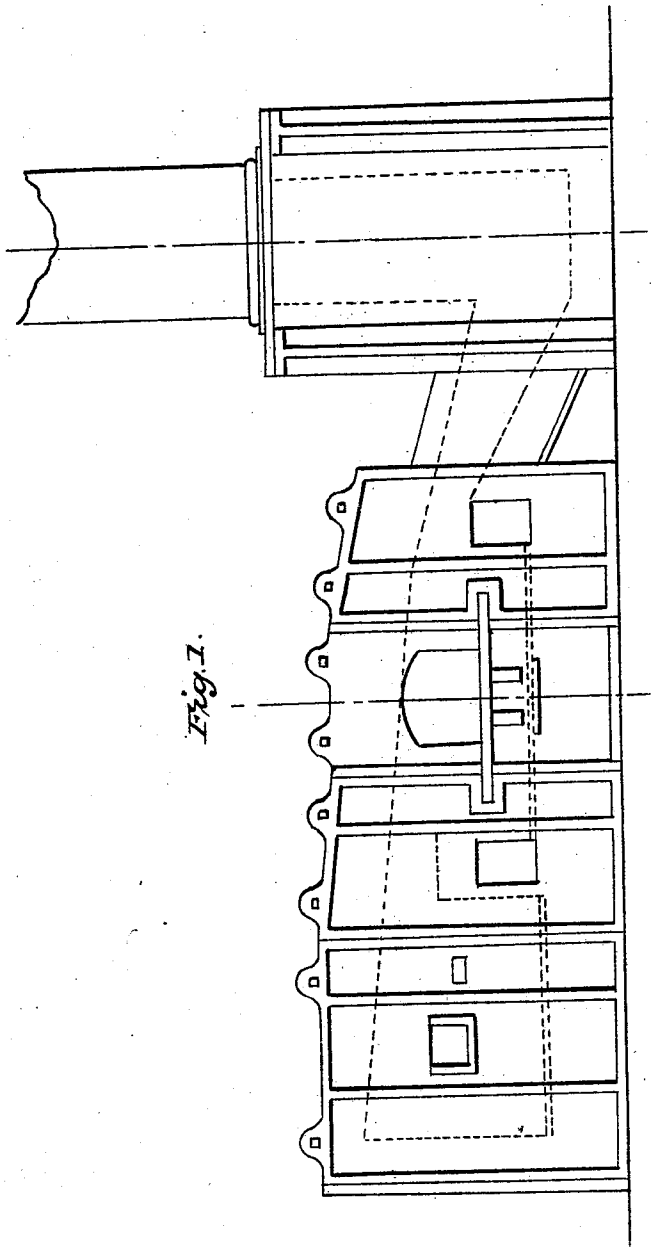

Fig. 1.

Witnesses
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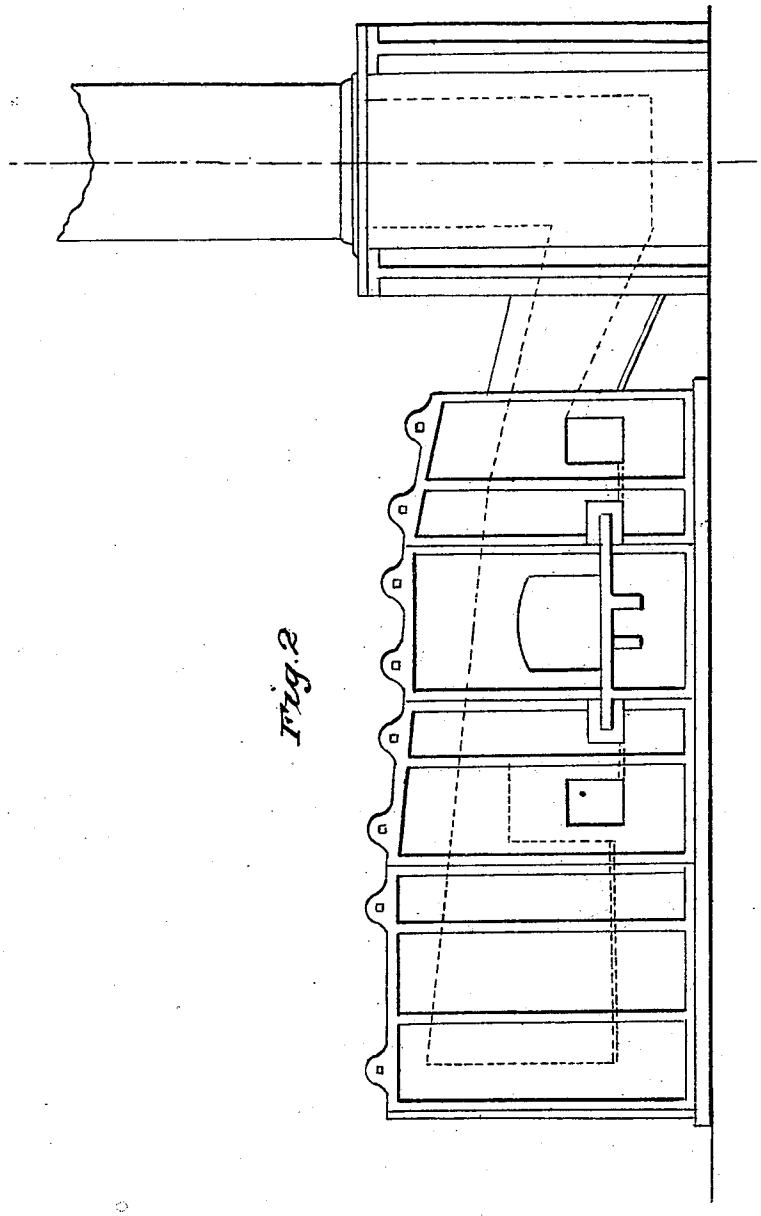

Fig. 2.

Witnesses
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J. PLAYER.

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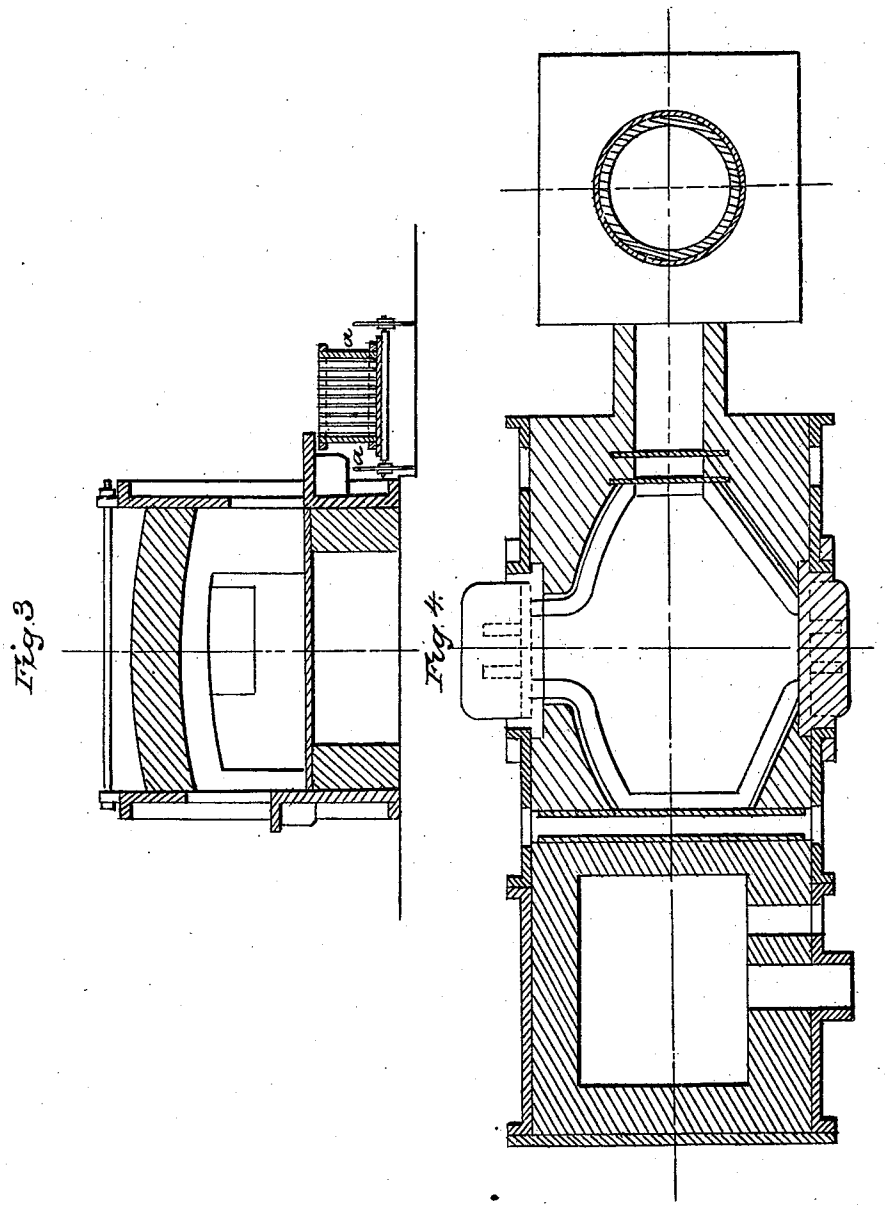

Fig. 3

Fig. 4

Witnesses:
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4 Sheets—Sheet 4.

J. PLAYER.

Manufacture of Balls, Blooms, and Slabs of Malleable Iron.

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Fig. 5.

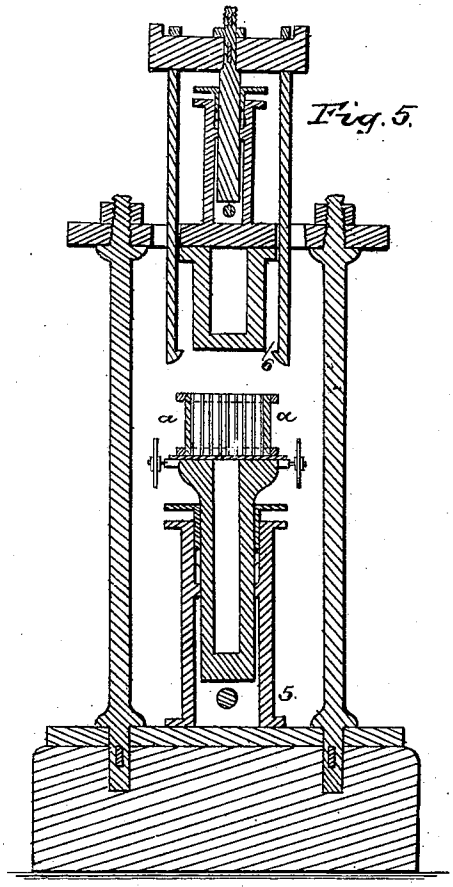


Fig. 6.

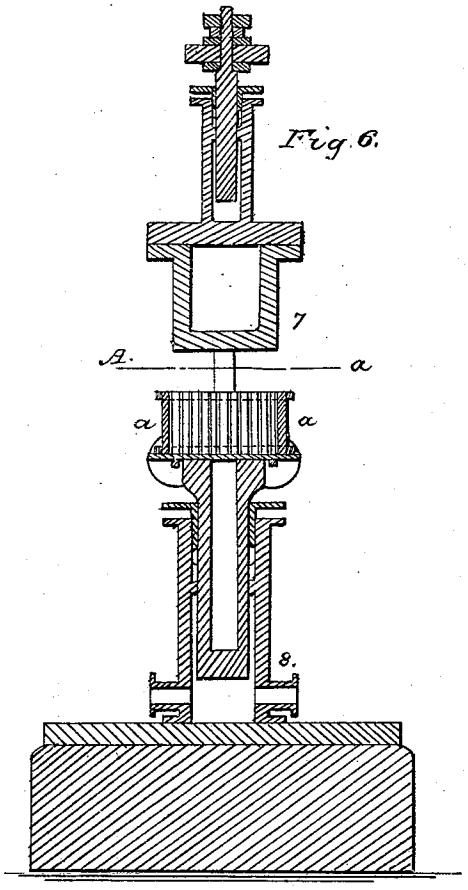


Fig. 7.

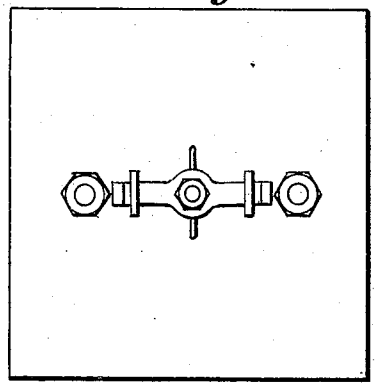
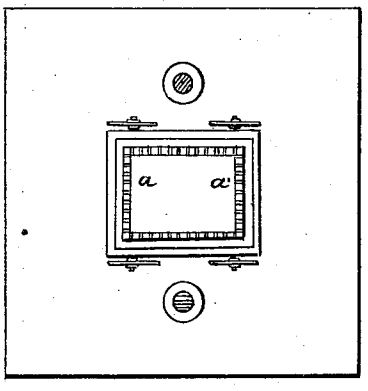


Fig. 8. A.a



Witnesses
Wm. H. Bishop
A. de Lacy

John Player Inventor
By James Henderson Attorney

N. PETERS, Photo-Lithographer, Washington, D. C.

United States Patent Office.

JOHN PLAYER, OF NORTON, ENGLAND.

Letters Patent No. 77,210, *dated April* 28, 1868.

IMPROVEMENT IN THE MANUFACTURE OF BALLS, BLOOMS, AND SLABS OF MALLEABLE 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 PLAYER, of Norton, near Stockton-on-Tees, in the county of Durham, in England, have invented new "Improvements in the Manufacture of Balls, Blooms, or Slabs of Malleable Iron or Steel;" and I do hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, and to letters of reference marked thereon.

This invention has for its object to facilitate the forming a ball, bloom, or slab of iron or steel after it has been deprived of a portion of its carbon and impurities by the puddling operation; and consists in transferring the semi-fluid malleable iron or steel into a form or mould outside the furnace in which the iron operated on has been converted, and subjecting the metal to heavy pressure in this form or mould, thus causing it to agglutinate or weld together into a ball, bloom, or slab, instead of "balling it up" by hand in the furnace in which it has been converted, which is the method at present adopted with puddled iron or steel.

For this purpose the crude or pig-iron to be made into malleable iron or steel is melted in a cupola or reverberatory furnace, and the fluid metal is then agitated, either in the same furnace in which it is melted or otherwise, either by manual labor or steam-power, or both, in contact with fluid oxide of iron and other matters, as is usual when puddling iron, until the mixture boils or froths up, and the iron becomes malleable, or, as it is termed, is "brought to nature." When in this state, the semi-fluid mass is forced or drawn out of the furnace in which it has been agitated, into a cast or wrought-iron receiver, form, or mould. In this receptacle it is then compressed to such degree of density that it can be removed from the mould and forged or rolled to the size that is required.

Whether the pig or crude iron operated on be converted into malleable iron or steel by machinery or manual labor, the process will be the same after the metal has been brought "to nature," or, in other words, made malleable. I will suppose a common puddling-furnace to be used.

Figure 1 of the annexed drawings is a front elevation of a common puddling-furnace, in which slight alterations have been made to adapt it to my process.

Figure 2 is a back elevation.

Figure 3, a cross vertical section.

Figure 4, a horizontal section thereof.

Figures 5 and 6 are vertical sections, taken at right angles to each other, of the hydraulic ram for pressing the puddled metal into a bloom.

Figure 7 is a plan thereof, and

Figure 8 a horizontal section at A *a* of fig. 6.

I prefer to have two doors opposite each other. One, the working-door, is of the usual construction. The other door opens to the level of the hearth; it may be constructed, and opened with a lever, in the usual way.

Before the furnace is charged, this door is shut and wedged close, and fettling of red ore or other material is rammed from the working-door against the lower part of it, so that the fluid iron, when melted in, or, by preference, poured into the furnace, cannot run under the door. The operation of puddling is then commenced, and the charge worked in the usual manner until the metal falls and is fit to ball up. It is then turned over in the slag and exposed regularly to the flame for a short time. In making steel, the operation is hastened towards the end. The slag is then partly run off in the usual way, the lower door is then opened, any fettling in front of it removed, and the whole or part of the charge, as may be required, is pushed or forced with a rabble or tup, which is introduced at the working-door, out at what is termed the back door into a form or mould hereafter described. As soon as the furnace is clear, which only takes two or three minutes, the back door is shut, and the furnace refettled and charged again with metal run in by preference in a melted state from a cupola-furnace. The saving of time in puddling one charge by this method is about twenty-five to thirty minutes; that is the time the pig takes to melt, and the time the charge takes to ball up.

The mould into which the puddled metal has fallen, is, by preference, made of vertical bars of square iron.

It may be constructed, as shown at *a a*, of square bars riveted inside two strong hoops of iron, the heads of the rivets being flush on the inside. This forms a receptacle with open top and bottom. The mould is placed on a low bogie, so that the top of the mould can be brought under the level of the sill of the back door of the furnace to receive the puddled metal when pushed through the back door. If the metal has not been sufficiently worked in the puddling-furnace, jets of blast from tuyeres suitably placed may be caused to impinge on it during the time it is discharged from the furnace. Air thus applied improves the quality of the iron, though it causes more waste. Olefiant gas may be used with advantage when "puddled steel" is being made, as it will prevent the carbon from being burned out during the time the charge is being pushed out of the furnace. The bogie should, after the puddled metal is on it, be removed as quickly as possible to the press, which, by preference, should be a hydraulic ram worked by an accumulator. The arrangement I prefer is shown at 5, 6, 7, and 8. The bogie fits on the top of the ram, and is carried upwards by it. Over the mould is a block of cast iron, which fits into it when the ram raises the mould and the block comes in contact with the puddled metal, which is thus pressed into a bloom. On the top of the block which fits into the mould is another ram, fixed to which is a cross-head, and hooks so arranged that it may be fastened to the hoops surrounding the mould. Then, by giving an upward motion to the upper ram, the mould is raised up, the sides of the block thus leaving the bloom of iron or steel on the bogie, which is then lowered and the bloom taken to a hammer, rolls, or otherwise disposed of. The mould is lowered on a bogie and used as before.

Having thus described the nature of my said invention, and the manner of performing the same, I would have it understood that what I claim, is—

The forming a ball, bloom, or slab of iron or steel, made malleable by the operation of puddling, by moving the metal out of the furnace where it has been puddled into a mould or form, in which it is subjected to heavy pressure, substantially as described.

In witness whereof, I, the said JOHN PLAYER, have hereunto set my hand, this 2d day of July, 1867.

JOHN PLAYER.

Witnesses:

JOS. CLEUGH,

WM. DAVISON.