# New Inventions.

**Making Malleable Iron Direct from the Ore.**

Our engraving illustrates an invention which promises to be of much importance, by M. S. Salter, of Newark, N. J. It relates to the making of malleable iron direct from the ore and consists in expelling the impurities of the ore by exposing it to a moderate heat during the first stages of the process, and in then gradually increasing the temperature; agitation is kept up throughout the operation. The whole process is effected by one fire, and by a single furnace of peculiar construction, a side elevation of which is shown in our engraving.

The furnace contains three chambers, A B C, arranged one above the other, the heat of the lower chamber passing into that next above, and so on.

The fire-place or grate for fuel, D, is at one end of the lower chamber, from which it is partly separated by a double wall, E, raised to a convenient hight, and over which walls a space is allowed for the passage of the draft.

The draft passes horizontally, in a reverberatory manner, along the entire length of the lower chamber, A, in the roof of which, at F, there is an opening into the middle chamber, B; it passes in the same manner through B, and thence through the opening, G, finally escaping by chimney H.

The ores, with the necessary materials for their reduction, are introduced into the upper chamber, C, through an opening in the roof; they are first suspended in the hopper-shaped receptacle, J, which is provided with a slide valve or shutter, K. The ores are then, at suitable intervals of time, removed to the draft opening, G, through which they are thrown down to the middle chamber, B; they are next thrown down openings. F, into the lower chamber, A; next they are removed to the lower chamber to the finishing basin, L, near the fire, D, where the effects of the heat are completed, and whence they are taken out, in the metallic state, ready for the hammer.

Through the sides of all the chambers openings, M, are made, through which the ores and materials may be frequently agitated by suitable instruments, and moved along from one end of the several chambers to the other, and finally through N, the metal may be molded and taken out from the furnace. The ashes are removed at O.

There are also openings for the blast, for the fuel, and for the letting off of any liquid matters which may accumulate in the finishing furnace. Through the floor of the lower chamber there is an opening, P, in the end opposite the fire, through which may fall the cinders and ashes, and other solid materials carried along thither by the draft. For the same purpose other suitable receptacles are provided in the other chambers.

To prevent any undue accumulation of heat in the middle and upper chambers, or to prevent the introduction to said chambers of cold air, or air charged with oxygen coming through openings in the lower chamber, flues, Q, are made to lead from the lower chamber upwards, directly through the top of the furnace. These flues are ordinarily kept closed by dampers, R, and when they are opened the draft is prevented from pursuing its ordinary passage by a damper, S, on the top of the chimney.

To prevent the too violent effects of the heat, openings, T, are made in sides and ends of the furnace, for the introduction of cold air between the roofs and floors of the chambers. The floors of the several chambers may be either horizontal or inclined.

The lower chamber, A, is raised up from the ground for the convenience of working, for the easy flowing away of liquid impurities, and for the falling down of ashes and cinders. This process is alleged to afford the following advantages:—

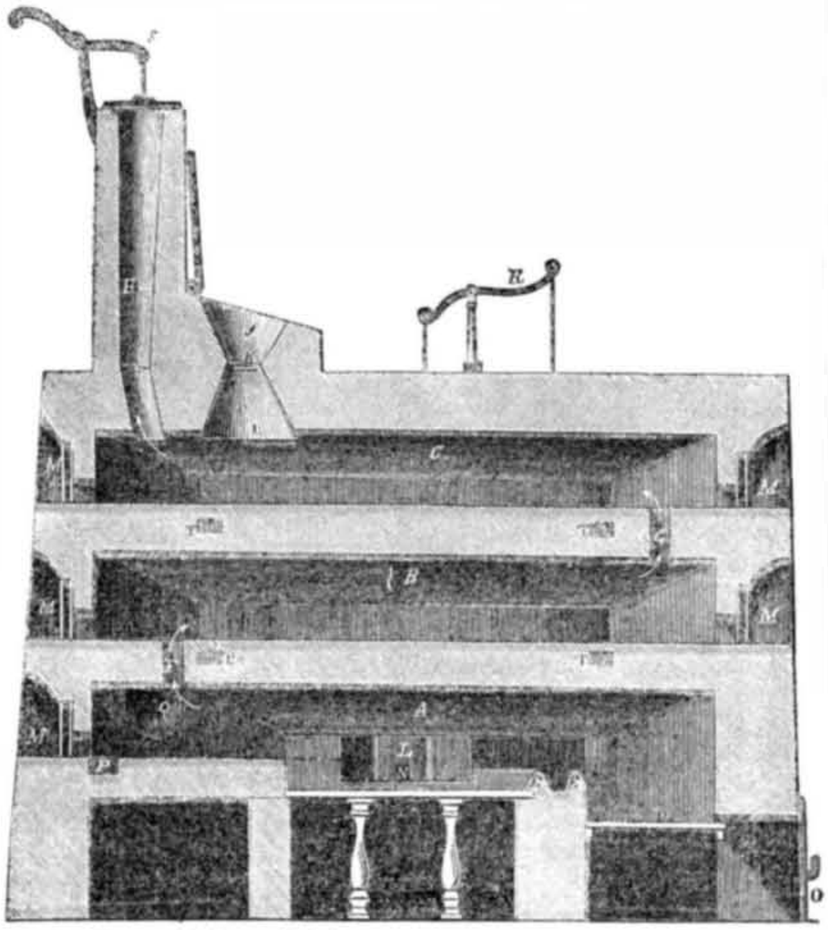
1. The gradual heating of the ores with the necessary materials for their reduction as they are moved nearer to the fire from chamber to chamber, and from one end of a chamber to the other.

2. Opportunity is afforded for the frequent agitation of the ores and materials, by which agitation the impurities are freely allowed to escape, the materials are properly mixed, and become, in turn, equally exposed to the heat and to the draft.

3. The draft is unconfined, and moves freely and rapidly for carrying off the impurities.

4. The atmospheric air is deprived for the most part of its oxygen by the fuel of the fire-place, and, therefore, while passing rapidly through the ores, it does not oxydize the metal, and does not consume the carbon, which is consequently allowed freely to extract the oxygen from the ores. By the gradual heating and freedom of draft and frequent agitation, an opportunity is afforded for the free escape of impurities in their natural order, beginning with the more volatile, and ending with the more fixed. Such escape of gaseous products is more difficult while a mass of solid materials from which they are generated remains at rest.

## NEW PROCESS FOR MAKING MALLEABLE IRON DIRECT FROM THE ORE.



5. The agitation may be carried on at different temperatures, so that the objects which it cannot effect at one degree of heat it will at another. This is the purpose of the three several chambers, of which the upper is the heating and vaporizing, the middle the mixing, and the lower the reducing and finishing chamber.

It is alleged that the ores can be reduced to metals of more than ordinary purity by the above-mentioned means. The ores of iron may be reduced to wrought or malleable iron without first carbonizing the iron. They may be reduced also to a carbonized state, either as steel or as cast or pig iron; this may be done by having less agitation and adding an excess of carbon.

The necessary materials for the reduction of the ores may be introduced at different temperatures, and at different stages of reduction, according as their presence may be needed. For example, when lime is required for separating silica from iron ore, such lime need not be introduced at the beginning of the process, when the temperature is low, for at such temperature it cannot act upon the silica, and its presence would certainly interfere with the free expulsion of other impurities. It may, therefore, be introduced partly in the middle and partly in the lower chamber, as needed.

The carbonic acid gas evolved from the limestone or shells introduced in the lower chamber tends to protect the carbon and ores and impurities from the residuum of free oxygen left in the draft.

It is claimed that this process yields a greater percentage of metal from any given amount of ore than is obtained by other furnaces heretofore used. The ores and the necessary materials for their reduction are, through the whole process, completely under control, subject to such various treatment as they may require at different stages of reduction, and opportunities are afforded for the escape of impurities without their combining with and carrying off the metals.

Another advantage claimed is that ores may be reduced by the use of anthracite coal alone, both as fuel and as the deoxydizing agent, the impurities of that coal (such as sulphur) are expelled at a low temperature before such coal acts on the ore, and, consequently, before the metals still in the ore can be effected by such impurities.

It is also alleged that there is a saving of coal to a large amount, both as fuel and a deoxydizing agent; this is effected as a deoxydizing agent, because no more coal is used than is necessary to extract the oxygen from the ores, none entering into the iron, and also from the rapidity of the operation, very little being carried off by the draft. The saving of coal as fuel is effected partly by the various facilities already enumerated, for the expulsion of impurities, partly by the prevention of the escape of heat, one chamber being compacted upon another, and partly by the long continuous range of the draft, to the whole force of which the ores are exposed by their position, agitation and falling. Owing to the freedom of draft there is no mechanical pressure by said draft upon the ores, therefore it cannot, by the force of such pressure, prevent the chemical decomposition of the ores, nor carry away the pulverized particles of ores and carbon.

We are informed that this process has been thoroughly tested and found to succeed far beyond expectation.

It is alleged to be so cheap and expeditious as to render the expense of producing malleable iron of the best quality less than that of pig iron made in the common blast furnaces. If this is so, it certainly is a remarkable invention, and will give a wonderful impetus to the manufacturing and industrial industry of this country. Patented Nov. 20th, 1849. For further information address the patentee as above.

THE MANUFACTURE OF IRON.—From time immemorial the manufacture of iron has been conducted with but little change in the methods; these may be divided into two heads. First, the production from the ore of pig or cast iron by smelting in blast furnaces. Second, the conversion of pig iron into a malleable state in small low furnaces, termed refineries, or by puddling in furnaces.

In the first process the ore (an oxyd of iron) is deoxydized by being burned with some carbonaceous substance, such as charcoal, coke, or anthracite. After burning a certain period, the ore is wholly deprived of its oxygen, and has become soft or wrought iron; it is at this point that it is desirable to arrest the process, but in the common furnace the materials are shut up from view for about twelve hours, and there are no means for ascertaining when the deoxydation has been completed exactly. As a consequence, the metal is kept at a high heat in contact with the carbon, after the oxygen has been driven off, and the result is a union of an excess of carbon with the metal, which is converted into a carburet—pig iron. This product is indeed more useful, compact, and portable than the ore, but it requires to undergo another expensive process before it is converted into wrought iron. Mr. Salter's invention for making wrought iron direct from the ore in open chambers, is designed to enable the smelter to arrest the reducing process at the point where the deoxydization of the ore has been completed, and before an injurious excess of carbon has been absorbed by the metal. By this method but one process is required, and wrought iron is thus produced, it is stated, at the same cost as pig iron; the latter is worth only $35 per tun; the wrought iron from $85 to $90.

Should the anticipations of the inventor be realized, his invention will work a revolution in the iron interest throughout the world; but will it operate practically? Is the question to be determined.

**Ice Creeper**

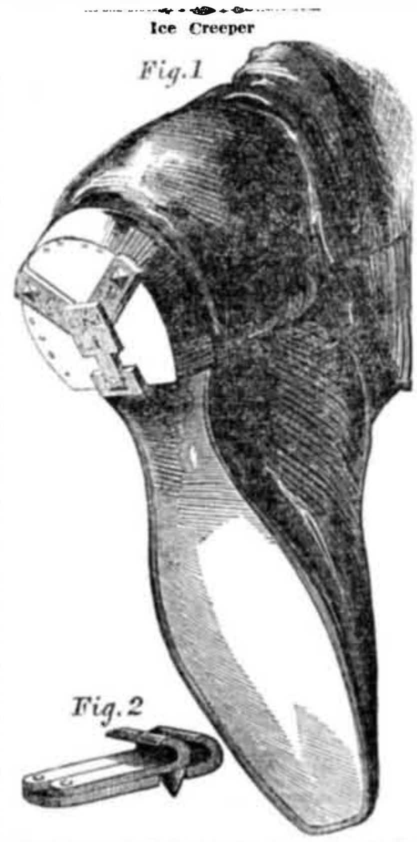


Fig. 1 Fig. 2

Our engraving illustrates a small contrivance to be attached to the heels of one's boots, to prevent slipping upon the ice. It consists of a central strip of metal, A, to which two other pieces, B C, are pivoted. as shown. The surface of each is furnished with a point or spur, which enters the ice. The extremity of each strip is curved into hook form, and these hooks serve as clamps to hold the contrivance to the heel, when it is spread and applied as in fig. 1. When not in use it may be folded, as in fig. 2, into compact form, and carried in the pocket. This is a neat, cheap, and convenient invention. Patented by Wm. H. Towers, March 5th, 1856. Address Thos. W. Williams, 39 South Fourth street, Philadelphia, Pa., for further information.

**Ward's Bullet Machine.**

The machine of Wm. Ward, of Auburn, N. Y. (which was noticed by us a few weeks since) for making lead bullets from wire, with extraordinary rapidity and accuracy, is now at the Navy Yard, Washington, for inspection by the officers of the government.

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