



WHITEHAVEN HERALD 28 Sept 1839

ON THE MANUFACTURE OF IRON.

TO THE EDITOR OF THE WHITEHAVEN HERALD.

Sir,—My attention has been directed to a sensible and well written article in the Whitehaven Herald, on a letter of mine to the Editor of the Mining Journal, relative to my plan for the production of wrought iron, direct from the ore.

Agreeing with most of the theory of the writer in the Herald, I am at issue with him principally on these two points:—

1st. The cost of my process in close vessels; and, 2d. The eligibility of accomplishing the deoxydation of the iron in reverberating furnaces.

First. The "extremely expensive apparatus of close retorts" will be found, on examination, to exist, more in idea than reality. Where fire clay is cheap, as it is here, I am of opinion, that the whole of the retorting apparatus, sufficient for the production of 100 tons of iron per week, may be erected for £2,000. If this estimate be objected to, I have to request that this part of the discussion be postponed for a short period, when I may be enabled to give the actual cost. I believe that a mill and forge, to manufacture the quantity of iron I have named, is estimated to cost from 6000l. to 8000l. Now, in my datum of 2000l. being the cost of the retorting erections to supply a mill and a forge, costing, say 700l., I have estimated the retorts as being erected with separate fire places, not as being attached to the puddling furnaces, (both plans are included in my specification), because I conceive, that where coal or slack is cheap, as here, the greater convenience of separate operations may more than counterbalance the additional cost of fuel; but if the "contiguous furnace," suggested by the writer in the Herald, be not objectionable, neither would my retorts, heated with the waste heat of the puddling furnace; and then the comparison of the two modes would be between the cost of his "contiguous furnace" and my retorts.

I may here remark, that a party is so erecting retorts, fuel being a great object in his vicinity, and if he succeed, of which I have little doubt, the only fuel consumed will be in the fireplace of the puddling furnace. With slack at, say 1s. 6d. to 2s. per ton, (which I believe is not much below what it is obtainable at with you,) and common labour, say at 15s. per week, I believe that the "serious addition to the cost of the product, which must greatly limit the extent of the produce," will amount to not more than 12s. per ton on the iron made. I mean, that with separate fireplaces, as described in the Mining Journal, the cost of preparing the ore, as respects fuel, labour, and wear and tear of retorts, will not exceed 12s. per ton on the iron made. When practice has introduced the economy, which so universally attends it, I look upon it, that even this moderate sum will be further decreased; and we must bear in mind, that the operation of which it is the cost supersedes—

- 1stly,—Roasting the common ironstone;
- 2dly,—Making Coke;
- 3dly,—Obtaining and breaking limestone;
- 4thly,—Erecting tower furnaces and steam engines for the blast;
- 5thly,—Heating the blast (if hot blast be employed), and
- 6thly,—Refining the crude pig iron—

Processes which, instead of costing 2000l. in apparatus, require an outlay of at least five times that sum for the production of the quantity of wrought iron named.

I now come to the second part of the subject—the deoxydation in reverberatory furnaces. This mode was the original one, which suggested itself to me, when I first commenced my experiments, two years ago. I found, however, that although decomposition of the oxide of iron took place to a certain extent, it was only partial, and on learning that my friend, Mr. John Dawes, of the Bromford Iron Works, had not been able to carry into successful operation a patent which he had taken out for this mode, I could scarcely hope to succeed, where a gentleman of great scientific ability, and possessing many practical advantages in the command of furnaces on his own premises, had failed. But, on considering the subject more attentively, I became satisfied of the ineligibility of any sort of open furnace; and although I am not so presumptuous as to maintain that "suitable" reverberating furnaces cannot be invented, I will, if you will bear with me, give my reasons for doubting the probability of any such being constructed or constructible.

The principal advantage of a reverberatory furnaces is in the application of flame to the heating of materials which it may be deemed desirable to keep from actual contact with the fuel; but the heat can only be applied to the upper surface of those materials, consequently to equalize a degree throughout the whole, the mass must be stirred up, and each part in succession, brought into exposure to the flame. According as the material is a better or worse conductor of heat with the mass takes a shorter or a longer time in becoming of the temperature required. Now, although metallic iron is a powerful conductor, the oxide is as powerful a non-conductor of heat; and, mixed with carbon, a more impenetrable mixture could scarcely be acted upon, and thus, rapidly to heat the mass, it must be continually stirred. By this stirring, the carbon is successively brought into contact with the oxygen of the atmosphere, and as it can more readily combine with it than (familarly to write) have the trouble of robbing the iron ore of its oxygen, great portion of the carbon will be consumed, and only such as is protected by the superincumbent mass be left to act on the oxide of iron. But this is not all; for even when some part of the ore is reduced to the metallic state, so great is the affinity of heated iron for oxygen, that from the necessity of having it so much longer in an open furnace than on my plan, much of it becomes re-oxided. I doubt not, indeed I know that decomposition will take place to a certain extent; but I do doubt the successful adoption of any mode of thoroughly de-oxiding the red ores in a reverberatory furnace, so as to bear a comparison with the plan I have patented, and for the following reasons:—

1stly.—Where the puddling of iron is necessary, it is not

teen minutes, the preparation of raw ore in the "contiguous," or any other reverberatory furnace, will take at least five times that period.

2dly.—The consumption of fuel for this greater length of time, in open furnaces, will be at least equal to what will be conjointly required for my retorting and puddling.

3dly.—The amount will be greater—the wear and tear as great.

4thly.—In an open furnace, as exact a proportion of carbon cannot be depended upon—a greater or less draught, one stir up, more or less, will, more or less, consume it; if there be too much, the iron will either be a description of cast iron, (as a carburet) or, if not, in a state of chemical combination, the mechanical mixture will, as is well known to all practical men, irreparably injure the quality;—if there be too little, it will be comparatively valueless, from containing so much "cinder" or undecomposed oxide of iron.

5thly.—When 54 per cent. of iron in blooms has, on my plan, been obtained from the raw ore, not one half that quantity will be got when reverberatory furnaces are used; and

6thly, lastly, and principally, while common, or "red-short" iron, must be the result of the mode suggested, (if the preceding be correct,) dependance can always be placed on the similarity of product where my mode is adopted, from the protection which the close vessels ensure to the exact proportioning of their contents; and this exactitude of definite quantity has enabled my plan continuously to produce iron, which I am assured is second to none made in this kingdom; indeed, I sha' be much surpris'd if it do not, to a great extent, supersede the importation of Swedish, and the manufacture of charcoal iron.

But, sir, to condense and recapitulate, all this can only be done in retorts, or other close vessels; at least, such is my conscientious, though perhaps vain, opinion.

As I hope to see Whitehaven a second Merthyr Tydvil, in this Iron Age, I trust you will not think I have trespassed too long on your columns, if this communication be even a feeble mean to such an end.

Your obedient servant,
Flimby, 21st Sept., 1839. W. N. CLAY.

CP. 31 MARCH 1840

In the course of last week, Mr. John Eilbeck, foreman of the smiths' works, in the Granary Yard, in this town, belonging to the Earl of Lonsdale, with the aid of engine machinery, bored through not less than sixteen feet three inches of malleable iron, in the short space of ten hours, with a bit one inch and a quarter in diameter. The weight of the borings, when collected together, was not less than fifty-six pounds. This herculean performance, we understand, has seldom been equalled, if indeed it be not altogether without a parallel in undertakings of a similar nature and description.