## THE INVENTOR OF PURIFYING MOLTEN CRUDE IRON WITHOUT FUEL AN AMERICAN.

(*From the Scientific American.*)

In the two preceding numbers of the *Scientific American* we have described and commented on the process claimed by H. Bessemer, of London, for rendering crude pig iron malleable without fuel—using only a blast of cold air in a close chamber to make the molten pig metal purify itself. We have good reasons for believing that this discovery is not Bessemer's, but J. G. Martien's, one of our own countrymen, formerly of Newark, N.J., who is a practical metal-worker, and who has been residing for some two years in Europe, engaged in introducing new improvements in the manufacture of malleable iron direct from the ore. He informs us that he worked the invention in the presence of a number of witnesses, long prior to the date of Bessemer's provisional specification; one of these witnesses—John Christopher, of Newark, N.J.,—now resides in Pittsburgh, Pa. He operated upon 2,000 pounds of crude molten iron in a chamber constructed like the one described by us two weeks ago, and tapped it off in six minutes after it was let in. The result was a refined carburet of iron, some of which was very malleable. The process was exactly the same as that described and claimed by Mr. Bessemer. He told his patent attorney in London of this, and requested him to include the discovery in his application for a patent. The principle he claimed was "the application of air in a natural or heated state under pressure, to fluid iron, from a blast or melting furnace, and in such a manner as to penetrate and *search* every part thereof, not confining himself to the kind of receiver in which the operation may be performed."

His attorney in London did not describe the invention in the manner desired by Mr. M., but the reason why, he could not then divine. It now appears that this attorney is greatly interested in Mr. Bessemer's success, and hence the reason for not strictly complying with Mr. M's wishes become evident.

Mr. Martien obtained his patent in England Sept. 5th, 1855, for improving the manufacture of iron and steel, "consisting of the application of atmospheric air by mechanical pressure, or steam for the better purification of the liquid metal below the surface of the said metal as it comes from the smelting furnace, or refinery, the air and steam to be applied separately or together, as may be desired, and in such manner as to completely penetrate and search every part of the said metal as it comes, or after it has flowed from a blast or smelting furnace, and prior to the congelation of the melted metal." This is an extract from his provisional specification, and it embraces the same process as that claimed by Mr. Bessemer, whose patent in England bears date 7th December, 1855—three months after Martien's was issued. This proves conclusively who is the original inventor.

Some persons may attribute these remarks to prejudice in favour of an American citizen, but we ask them to look at the dates of these patents; and if they go to the legal documents themselves, as we have done, they will become convinced that Mr. Martien's process is the same as that claimed by Mr. Bessemer, and that the former is the first inventor. We hope that all the attempts made to deprive him of the benefits of his invention in England and elsewhere will end in failure.

Long articles have appeared in quite a number of the English newspapers flattering Mr. Bessemer highly, and praising his discovery. From the tone of these, and the peculiar sameness of ideas contained in them, it is evident to us that he far surpasses Mr. Martien, our countryman, in his knowledge of the properties of the *hot and cold blast*, in its application to the British press.

Mr. Martien is supported in his claims by some powerful English iron amnufacturers, and they will be pressed and secured in the United States at a proper time, the papers having been lodged by us for that purpose some time since in the Patent Office.

In the last number of the London *Mechanic's Magazine*, August 30th, received by us, C. Sanderson, of Sheffield, England, an old and experienced practical metallurgist, while he admits that the decarbonizing of pig metal without fuel is an improvement, positively asserts that iron so manufactured will not admit of being drawn under a hammer, or rolled into a bar. He also asserts that the steel so made is not cast-steel; that it cannot be made into a boring tool, or fashioned under the workman's hammer.

In our next number we will illustrate the invention, and present some other interesting information concerning this alleged wonderful discovery.

[Our contemporary is somewhat amusing. He reminds us of the lawyer's pleas—first, that his client never had the kettle; secondly, that he returned the kettle; thirdly, that his client paid for the kettle, and is entitled to keep it. Our friend has good reason for believing, first, that this is not Bessemer's, but Martien's discovery; secondly, that Martien's patent agent, having an interest in Bessemer's process, failed properly to specify; thirdly, that Martien's specification, nevertheless, *does* comprise all Bessemer's invention; lastly, that, after all, the invention is worth nothing, and is only an "alleged wonderful discovery!" We have the sour grapes here with a vengeance.—Ed.]

## UCHATIUS' IMPROVEMENTS IN THE MANUFACTURE OF STEEL.

Some interesting trials of the process invented by M. Uchatius, Captain of Artillery in the Austrian service, have recently been made at the Albion Works, Blackfriars, by permission of the proprietors, Messrs. George Rennie and Sons. The last exhibition of the process took place on Saturday, before a large and select meeting of scientific and practical men, from various parts of the country. Captain Uchatius' process has occasionally been referred to in our pages; but, prior to giving the details of the trial, it may be convenient to recapitulate the principles of the process, and to contrast it with the ordinary process now practised. In the ordinary process for cast steel, there are three stages of manufacture from the pig iron:—First, the conversion of pig iron into bar or malleable iron; secondly, the conversion of bar iron into bar steel, or a blister steel; thirdly, the breaking up and remelting of bar steel to form cast steel. This process is circuitous and costly, because it consists virtually in abstracting from the crude iron the whole of the carbon in combination with it, when it becomes bar iron; then, in restoring a portion of the carbon, when it becomes bar steel; lastly, in consequence of the want of perfect homogeneity of the steel thus prepared, the bar steel is broken up and melted, that it may be fused together to attain to a thorough uniformity of substance as cast steel; whereas, M. Uchatius' process is much more simple and direct. It consists in abstracting carbon from the crude iron, and leaving in combination just so much of that element as is necessary, in chemical union with the iron, for the formation of cast or homogeneous steel. For this purpose, the pig metal is granulated, or reduced to globules, by pouring the melted metal into a vessel of cold water agitated by mechanical means to disperse and divide the metal. The metal, thus minutely subdivided, is in a condition suitable for conversion into cast steel; it is intimately mixed with oxides, or oxygenised materials, and subjected to a cementing heat, under which it yields up by degrees a portion of the carbon in union with it, to combine with the oxygen discharged from the materials in mixture. The carbonic acid gas so formed is expelled by the ordinary vents, and the remaining carbon, previously in a state of mechanical union with the iron, enters into chemical union with it. The iron thus transformed, melts by the continual application of heat, and is finally poured off as homogeneous cast steel. The extent of the decarbonisation is limited according to the size of the granules. The finer the granulation the softer is the steel—the softer sort of welding cast steel may be obtained by an addition of wrought iron in small pieces, and the harder qualities by adding charcoal, in various preparations, to the mixture. "What I claim as my invention," says Captain Uchatius in the specification of his patent, "is the conversion of pig iron into steel by subjecting the same, when reduced to a granulated state, in crucibles, to the combined action of oxygen, heat, and fluxes, whereby I am enabled to manufacture cast steel of a determinate quality, and obtain it at one melting."

Such are the processes, in contrast, according to the old and new systems, for making steel. On the last day of the trials—which, we ought to mention, were conducted by M. Uchatius' partner, M. Leuz—the business of the day was divided into two parts, which were conducted simultaneously, in order to shorten the duration of the trial. Twenty-four pounds of Indian pig iron, which had been granulated on a previous day, were intimately mixed with six pounds of spathose sparry iron ore, containing 1½ per cent. of oxide of manganese; making a total charge of thirty pounds. This was placed in an empty crucible prepared for it, and previously heated in a temporary coke furnace. The mixture was kept in the furnace for a period of 2¾ hours, though it should here be remarked that a period of 1½ hours is usually sufficient for the process, when the crucible was withdrawn, and the metal poured into an ingot mould. The ingot weighed twenty-five pounds, and it was estimated that one pound of steel remained in the crucible amongst the slag, which would make a total produce of twenty-six pounds of steel, from twenty-four pounds of iron, with its quota of two pounds from the iron ore.

Whilst the steel was in course of formation, a quantity of melted pig iron was taken from the furnace for granulation; it was poured into a butt of water, being scattered and shaken amongst the twigs of a birch broom, in its fall. It emitted brilliant showers of sparks, and, on subsequent inspection, was found to be reduced to irregular globules, like swan-shot.

During the same interval, an ingot of steel that had been manufactured on Uchatius' process on a previous day in presence of many witnesses, was heated and drawn down under Nasmyth's hammer, from a scantling of 2½ to 2¾ inches square to 1 inch square. The steel proved, on fracture, to be of good quality, though it must be remarked that specimens of ½ inch square steel, made at a previous meeting from another ingot, showed a much finer fracture. Of course, the degree of hammering to which the steel had been subjected, has had much to do with the quality of the steel. Moreover, in the manipulation of the steel by a 7 cwt. hammer, at sixty strokes per minute, they laboured under great disadvantages. For, as is well known, the best quality of steel can only be produced by means of a 1½ cwt. or 2 cwt. hammer, on an elastic helve, with a quick percussion action, at the rate of 200 to 300 strokes per minute.

M. Leuz expressed his preference for Indian pig iron in these trials, as it is similar in character to Austrian and other foreign irons with which he was familiar, and because he had not yet had sufficient experience of the working of English iron. Charcoal irons were those with which he could deal with the greatest certainty, and it would be necessary, in dealing with English irons, to free them from phosphorus and sulphur, though he had not the least doubt of their being equally well adapted for the manufacture of steel. He had already operated upon some of the ordinary pig irons of this country with results which he considered promised remarkably well for the future.

As to the saving in the cost of production, it must be something very considerable, when it is noted that a process which occupies the best part of a fortnight or three weeks, in the ordinary way, is on this plan consummated in a few hours. According to M. Leuz's estimate, the cost of steel made by his process from Indian pig would be under £15 per ton, and he believes that at least two-thirds of the cost of production by the prevailing method will be economised by the "Atomic process." Certainly, if the opinions of competent judges may be taken, the market value of the steel manufactured on the new system, assigned by them, would induce us to believe that with respect to the estimated cost, M. Uchatius' expectations of a large measure of economy appear to be warranted by the results of the recent trials. Some excellent chisel steel has been made, from which chisels were forged—these were severely tried on blocks of wrought and cast iron, and they bore the test successfully. It must be added that the furnace men engaged on the trials were brought from the well-known works of Messrs. Turton and Sons, Sheffield.

## THE SEWAGE QUESTION.

A letter, of which the following is a copy, has been transmitted to the Chairman of the Board of Works.

(*To the Chairman of the Metropolitan Board of Works*)

Sir,—May I take the liberty of laying before the Metropolitan Board of Works, my proposition for the drainage of the Metropolis and the application of the sewage as manure—partly in a solid form, but principally in a liquid—to land, by means of patent steam-engines, machinery, and apparatus, both for the application of the sewage and the cultivation of the soil. A short account of it appeared in The Engineer of the 10th inst.—a copy of which accompanies this—and is in substance as follows:—

1st. Divide the metropolis into manurial districts, in size according to the areas of the respective fields to which the sewage is to be applied, due attention being paid to make the higher levels of the manurial district serve the higher levels of land. Let there be one or more engines in each district, with pumps, for sending the whole of its sewage in metal pipes to the country as fast as it flows to the engines, and let the sewage of each district flow to the engines in glazed earthenware pipes. Also let the necessary patent engines, machinery, and apparatus be used in the fields for the successful application of both the solid and liquid manure, as season and circumstances demand.

2nd. The mainspring of the whole is a proper paying field for application, and propably no capital in the world is so favourably situated as the metropolis of England in this respect, for in the immediate neighbourhood there is a sufficient area of barren heath, sandy downs, waste common, and chalky soil, for using the whole sewage economically. These are the very kinds of soil, too, to which a continuous flow of sewage can be most successfully applied, for on the London clays it cannot be so used during the depth of winter—that period of the year when there is probably most sewage—as it would then flow back to the sewers on the surface; but the sandy and chalky soils in question will always be in a state to drain up the greatest flow of sewage. The once barren sandy beach between Leith and Portobello, now yielding a clear profit of upwards of £10 yearly per acre, may be taken as a successful example in proof of this.

Let, therefore, an Act of Parliament be got without delay to secure the above lands to the inhabitants of the metropolis, as landowners, with power to carry out my proposition. Let each manurial district have its own allotment; and if properly farmed under steam culture, I venture to say that the proceeds of Italian rye-grass, &c., &c., will yield redeeming interest on the capital invested, as a glance at the facts of the case will shew; thus:—

A population of 2,500,000 will yield annually upwards of 1,000,000 tons of fæces and urine in their natural state. Add to this the dropping of cattle, soap-suds, &c., &c., and the result will amount to nearly the equivalent of half a million tons more; but say only 1,000,000 tons, sufficiently diluted with water for application. Now such a dose, successfully applied, ought, at least, to produce an increase of produce of the annual value of £500,000. If a ton of fæces and urine, I repeat, do not yield an increase of produce of the value of ten shillings yearly, it is bad farming. Such a population would yield, of solid matter, 74,000 tons, superior to Peruvian guano; so that, at the price of guano, it is worth more than £740,000. No farmer would think of turning less out of guano than double the above hypothesis, so that £1,000,000 of increase of value of produce would be nearer the result than half that sum, after a few years' application of the manure.

I have also shown in The Engineer that the atmosphere of the capital will be more polluted under any of the sewer systems lately proposed than at present by the Thames; and public attention cannot be too seriously turned to the pestilence-breeding character of brick sewers, and the impossibility of containing in them the compounds of hydrogen and ammonia—the poisonous character of which, especially the former, is too well known to require notice. From the burrowing of rats, and the open, porous, artificial grounds about the foundation of houses, the metropolis is annually becoming more and more situate on *a hot-bed of pestilence;* and nothing can arrest this growing calamity but the speedy removal of the sewage in metal and glazed pipes, as I propose.—I have the honour to remain, Sir,

Yours truly, W. Burness.

2, Prospect-terrace, Brixton, Surrey, Oct. 13, 1856.

## METROPOLITAN BOARD OF WORKS.

The ordinary weekly meeting of the Metropolitan Board of Works was held on Friday last at Guildhall; Mr. Thwaites in the chair.

The business paper was more than usually heavy, containing not less than 98 distinct matters for the consideration of the Board, the greater number of which were applications by different parties for permission either to construct or alter buildings. The financial statement showed a total general balance of £113,821 17s. 11d.

### THE SITE OF OFFICES FOR THE BOARD.

Mr. Hawkes presented the report of the Committee on the Site of Offices It stated that the committee had, in pursuance of instructions from the Board, advertised in six London papers for a site on which to build offices for the use of the Board of Works. The offers which they had received were very few. The new building at the corner of Chancery-lane, Fleet-street, occupied by Mr. Hodgson; the site of the late Fleet Prison; the Bridewell Hospital, and one or two other places, had been brought to their notice; but there appeared to the committee to be strong objections against them all, and they therefore came to the resolution to recommend that the premises in Greek-street, Soho, formerly occupied by the late Commission of Sewers, should be adapted for the purposes of the Board.

Mr H. L. Taylor objected to the report being received, on the ground of its being informal.

The Chairman said the committee had certainly gone beyond their instructions in recommending any particular site.

Mr. Hawkes said, the committee had really received only two communications that were at all eligible, the others being wholly out of the question. The one was that at the corner of Chancery-lane; but the objection to it was, that the house was in the midst of the noise of Fleet-street, and over a shop. The other was the vacant space in Farringdon-street, where the Fleet Prison formerly stood, the frontage of which was 100 feet, and the depth 120 feet; but it was surrounded with buildings, except in the front, so that no light could be obtained. The pressing necessity of some building being provided for the Board was obvious, and he should therefore move that the report be received.

Mr. Leslie seconded the motion. The committee had advertised for a site consisting of 10,000 feet of ground. The Board had already got 9,940 feet of freehold ground in Greek-street, and he was of opinion that no better plan could be adopted than to avail themselves of that situation.

After some further discussion the receipt of the report was agreed to by a majority of 3—15 voting for its reception and 12 against it.

Mr. Hawkes then rose to move that the report be agreed to; but the Chairman said this could not be done until the order of the Board to the committee be rescinded. With regard to the site of the late Fleet Prison the committee had no power to treat, in consequence of the corporation of the City of London only letting their lands on tender, and the committee had not been authorised to make any tender.

The Board then proceeded to the next order of business on the paper.

### NOTICES OF MOTION.

Mr. Leslie then gave notice of the following motion:—"That the labours of the committee on the building site, and the advertisements for 10,000 feet of ground on which to erect offices for the Board having failed to produce a site, and there being 9,940 feet of freehold property in Greek-street which have been already paid for by the ratepayers, all the previous orders of the Board on the subject be rescinded, so as to enable the Court to decide the question whether the said 9,940 feet of property should not be adapted for the permanent use of the Board; and that a premium of 100 guineas be offered for the best plan that may be furnished the Board, which shall include a court-room of larger dimensions, and be better lighted and ventilated than the Council Chamber of the city of London."

Mr. Nicholay said, he would give notice of a motion that when the engineer's report on the general northern and southern drainage of the metropolis was discussed, there should be laid before the Court the memorial of a large number of persons, tenants and occupiers of lands in the lower hundreds of Essex, praying that they may have the privilege, for irrigating purposes, of using the sewage, if the Board should decide upon an outfall on the sea coast.

### PRIVILEGE OF MEMBERS OF THE BOARD.

Mr. H. L. Taylor said, before the superintending architect proceeded to read his reports, he wished to call Mr. Joseph Smith, one of the surveyors of the Board, in order that he might answer questions touching information respecting certain calculations said to have been furnished by him to a member of the Board.

Mr. Smith was, after some discussion, called and examined. He said he was a surveyor in the employ of the Board, and was applied to by letter by a member of the Board (Mr. Doulton) for certain information respecting the main drainage of the metropolis.

The letter was put in and read, the question being as to whether Mr. Smith had ever made an estimate of carrying the sewage to Sea Reach by two distinct lines.

In reply, Mr. Smith had sent a copy of a rough estimate, prepared by him, from which it appeared that the first cost of the works on each side of the river to Sea Reach would amount to £3,718,416; whereas by the conjoint scheme by Barking, £3,844,300, showing a saving of £126,000 by the separate system.

The reading of Mr. Doulton's letter, and Mr. Smith's reply to it, led to a very lengthened discussion, on the right of the surveyor to give information privately to members of the Board; this ended by

Mr. H. L Taylor moving "That Mr. Smith, as a subordinate officer of the Board, had acted indiscreetly, and had committed a breach of confidence in communicating crude information upon an important subject connected with the main drainage of the metropolis to an individual member of this Board, without the authority of his superior officer."

Mr. Collinson seconded the motion.

After considerable discussion the Chairman declared that the majority of the Board had voted that the motion should not be put.

The Court, after having been occupied upwards of four hours, proceeded to consider the report of the superintending architect on matters of ordinary routine, and then adjourned.

A meeting of the Board was held on Monday, for the purpose of considering the report of the Committee of Works and Improvements, on the subject of