THE WELLS PROCESS

FOR MAKING

RUSTLESS IRON

The Wells Rustless Iron Co.

21 CLIFF STREET,

NEW YORK CITY.

THE WELLS RUSTLESS IRON CO.

No. 21 CLIFF STREET, N. Y.

Works: Little Ferry, N. J.

Gentlemen:

We would call your attention to our process for oxidizing Iron, to make it rustless.

Oxidized Iron is now very popular with Architects and Engineers.

After a long experience and very careful and costly experiments, we have developed our present process; which is far superior to all others in the quality of work produced and in cost of operation.

Having obtained patents in this and many other countries, we are now prepared to issue licenses for shop rights or to sell territory.

Perhaps you could profitably use the process in your works. We will be glad to furnish further information.

Respectfully yours,

THE WELLS RUSTLESS IRON CO.

THE WELLS PROCESS

FOR

MAKING RUSTLESS IRON.

Iron and steel are made "Rustless" by forming on their surfaces a Magnetic Oxide of Iron. This is most economically and thoroughly done by the Wells process.

Oxidized Iron has been in the market in Europe and this country for a number of years, and is becoming so well known and is so much appreciated by those who have used it, that it has ceased to be a matter of experiment.

No foreign material such as *paint* or *alloy* is applied to the metal, so that the coating is perfectly pure.

Surfaces of Iron and Steel treated by *our* process have a pleasing blue-gray or blue-black color and if the article is polished before treatment it has a lustrous ebony-black finish, which gives a beautiful effect.

The Wells process is the best, simplest to operate, and cheapest process for producing the Rustless or Black (sometimes called Magnetic) Oxide of Iron on Iron or Steel surfaces.

This process has been created after a long series of costly and trying experiments.

Mr. W. T. Wells commenced early in 1884 to use the processes of the Bower-Barff Rustless Iron Co. He found that they were not commercially successful, owing to the great lack of uniformity in the results obtained. The theory taught by the Bower-Barff Rustless Iron Co. is to oxidize the Iron to a red or *sesqui* oxide and then reduce this red oxide to the black or magnetic oxide by the action of Carbonic Oxide Gas. It is very easy to oxidize to the red oxide, but the difficulty was

encountered in the attempt to reduce this red to the black oxide. Theoretically it is simple and easy but in practice it is very difficult to build furnaces which are perfect enough to accomplish it.

After working with the Bower-Barff processes for over a year with almost no good results, Mr. Wells made a discovery which he gradually developed and studied out till he produced the very simple and very excellent process which we now have patents for in this and foreign countries.

We produce a Rustless Oxide evenly and *thoroughly* distributed over the *whole* surface of the iron articles treated.

Our process is not the guess work or theorizing of any one, but is the result of years of study and practical experience, and has been created at very great expense.

Although the results of the treatment are uniform and satisfactory, we have not ceased to carefully study the matter in hopes that eventually we may be able to produce the coating in a malleable condition, so that treated iron may be bent and worked the same as common iron is, without injury to the coating. No one has as yet been able to produce such an oxide.

Treatment by our process appears to greatly improve the quality of the iron treated. This is specially noticeable in fine castings, which are much stronger after treatment than before.

The finished iron has the pleasing blue-gray or blue-black color which is so much in demand for iron work.

In this process the articles to be oxidized or treated are put into a comparatively cool fire brick chamber which is heated by the combustion of Producer Gas mixed with air. In this first step it differs very materially from the Bower-Barff process, as in that the oxidizing chamber is first heated extremely hot and then the charge quickly put in, causing a very great loss of heat and the bending and twisting of fine work, due to sudden and uneven expansion. This is all avoided in the Wells process, and the most delicate castings are not warped or twisted. Upon the chamber door being closed the chamber or muffle is very slowly heated, the charge of goods heating with it. When the work has all been raised to the proper temperature, it is then subjected to the action of mingled steam and carbonic oxide gas, which produces *at one operation* the Black or

Magnetic or Rustless Oxide of Iron. After a sufficient exposure to the mixture, the charge is withdrawn and allowed to cool. What part the carbonic oxide gas plays is very hard to *definitely* state, but careful *laboratory experiments* show that Iron heated in a closed wrought Iron muffle and subjected to the action of *steam alone* will have a somewhat chrystaline coating and that there will be more or less *sesqui* oxide formed. But when Iron is heated in the same muffle and subjected to the action of the mingled steam and carbonic oxide gas the result is an even, perfect and more tenacious coating of magnetic or black oxide.

We are constantly receiving the very strongest testimonials as to the merits of our goods, a few of which are found in the last pages.

We herewith annex an article from *The Metal Worker* of Sept. 1st, 1888 and *The Iron Age* of Sept. 13th, 1888. with cuts of our furnaces as now in operation at Little Ferry, N. J., and Chicago, Ill.

WELLS' RUSTLESS IRON.

The Wells Rustless Iron Company, 21 Cliff street, New York, had for some time previous to this year been manufacturing protected ironware under the Bower-Barff patents. A year or more ago, however, they began experimenting with a new process, the invention of Mr. W. T. Wells, the president of the company, and since the first of the year they have been using the Wells process exclusively. Iron protected by magnetic oxide has become such a popular article in many lines of trade that a description of this new process will be of interest to our readers. We will describe at first the process, and follow with a description of the furnace used. The charge of iron or steel articles to the amount of some 12,000 pounds weight is placed in an ordinary muffle or heating chamber and there gradually heated during a period of some 12 hours. It is important not to heat any part of the charge so as to blister it, and yet every part must be raised to the dull-red heat required by the process. The inventor prefers to use the gas made by the well-known Siemens' Producer in heating the charge, and to admit air in limited quan-

tities into the chamber along with the gas coming from the producers, just enough to consume the latter and give a small flame in the chamber. During this operation the dampers are opened, permitting the escape of the products of cumbustion into the chimney. The heating must be gradual, so that the charge will be raised in temperature evenly and equally and all blistering avoided. The increase of temperature should be so regulated that the maximum of heat is reached at the end of about 12 hours, though if a smaller charge than the one mentioned is used a shorter period will suffice. The surface of the charge by this gradual heating is apt to become somewhat oxidized both to red and black oxide, but the effect is irregular and patchy where it does appear at all, and is not of any general importance in the result. The next and final step in the process is to turn on a mixture of steam and carbonic oxid gas when the chimney damper is closed. In this atmosphere of steam and carbonic oxide the charge is left for some five hours, more or less. The heat of the charge at the beginning of the operation is a dull-red and air should be excluded as far as possible. The steam, it is said, need be under little or no pressure, and may or may not be super-heated before introducing into the chamber. This final step of the process is the essential one, in which is produced the desired result of black or magnetic oxide. We will now describe, with the aid of sectional views, the furnace employed, which is an ordinary muffle or heated chamber of the usual construction. It does not require any special appliances to make it absolutely air or steam tight, or capable of standing high pressure, as the Wells process, it is said, does not require such elaborate or costly apparatus. The inventor does not limit himself to the employment of any particular kind of apparatus, but following is a description of what he considers the best for carrying out his process.

Referring to the engravings, Figs. 1 and 2 are vertical longitudinal sections of the furnace, which is built of masonry, in the ordinary way, about 5 feet high, 25 feet long and 6 feet wide. Figs. 3 and 4 are horizontal sections of the furnace, while Figs. 5 and 6 are transverse vertical sections. The section in Fig. 1 is made on the line *f f* (Fig. 3), and on the line *e e* (Fig. 5). Fig 2 is a

section on the line *g g* (Fig. 5). Fig. 3 is a section on the line *h h* (Fig. 1) and on the line *a a* (Fig. 2). Fig. 5 is a section on the line *d d* of Fig. 2. Fig. 6 is a section on the line *c c* (Fig 2). Referring now to the special parts of the furnace V is the gas valve; A (Fig. 2) is an air valve; G is a gas flue; H is a steam valve; C combustion chamber; O (Fig. 2) an opening into the port chamber I (Fig. 6); *k k k* (Figs. 1, 4, 5 and 6) port holes; T is the main heating chamber; with an escape at E (Fig. 3). D is a chimney damper (Fig. 1) and F in the same figure is the chimney flue; P. (Fig. 2) is a checker work in the combustion chamber; *s s s* are sight holes in the back of heating chamber; *l l* are curtains of masonry. When the articles are to be treated for the production of a rustless oxide on their surface they are placed in the heating chamber T, through the door B (Fig. 2). The charge is gradually heated up through a period of, say, 10 to 12 hours, according to the size, by means of gas from a Siemens producer, admitted through the flue G by opening the valve V. A small quantity of air is also admitted for the purpose of combustion by opening the valve at A, Fig. 2, during which operation the damper D, Fig. 1, is opened, permitting the escape of the products of combustion to the chimney. The gas, entering through V, mingles with the air passing through A at the extremity of the curtain, and is further mixed with the air by the checker-work P in the combustion chamber. The burning gas, passing through O, enters the port chamber I (Figs. 3, 5, 6), from which it passes up through the port holes *k* around, through and over the charge in T, and thence through the portholes *k* into the escape flue E, to the chimney flue F. When the charge has been heated to a dull red, the valve A, Fig. 2, is closed and steam is admitted through the valve H, the damper D being closed. For five hours the charge is submitted to the action of the mingled steam and carbonic oxide gas, the air being excluded as far as possible. The magnetic oxide produced by this process is described as very hard and comparatively inelastic. It stands frictional wear well, but is apt to be injured by hammer blows or rough usage. Wherever the coating is removed rust will form, but it will not burrow under and raise the adjacent coating. The works of the Wells

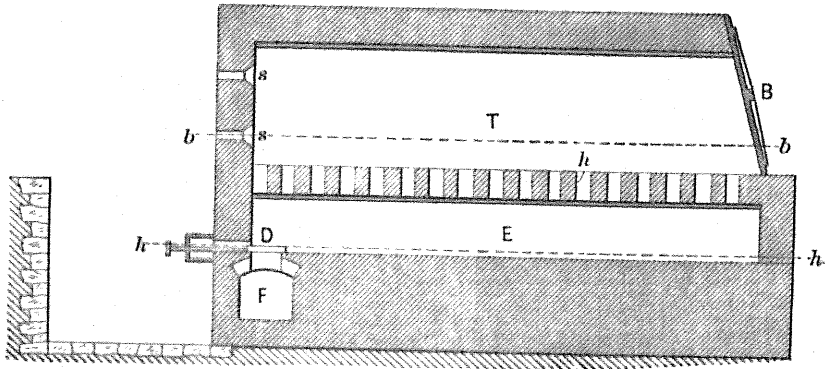


FIG. 1.—VERTICAL LONGITUDINAL SECTIONS OF FURNACE.

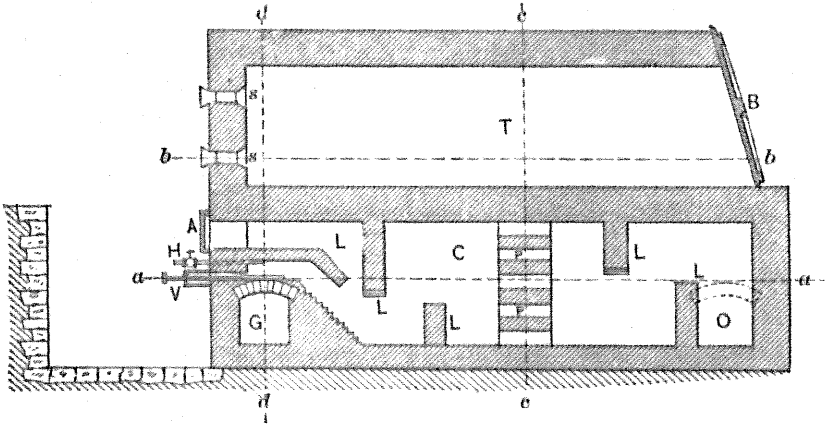
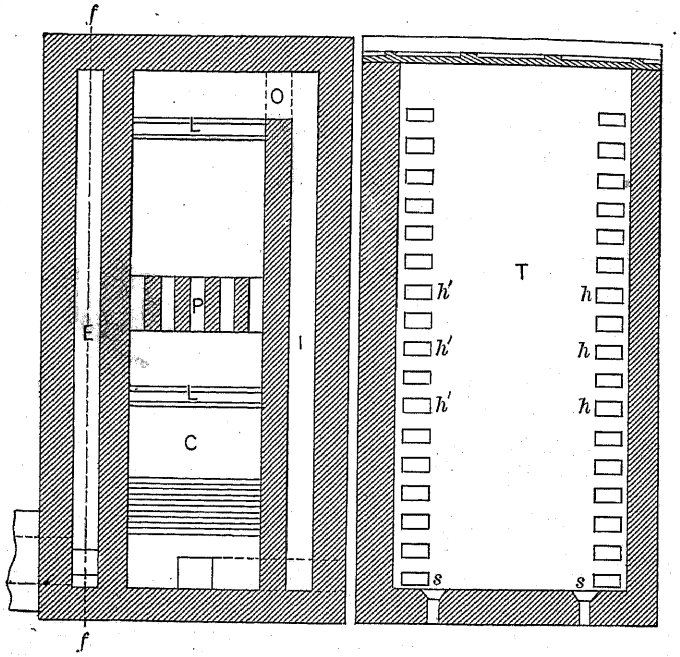
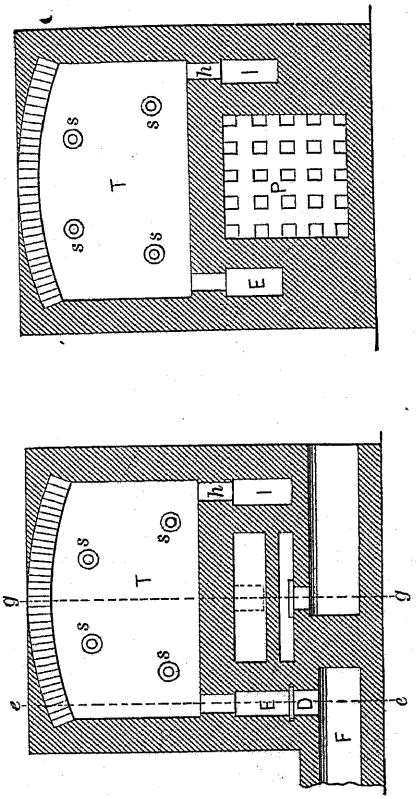


FIG. 2.—VERTICAL LONGITUDINAL SECTIONS OF FURNACE.



FIGS. 3 AND 4.—HORIZONTAL SECTIONS OF FURNACE.



FIGS. 5 AND 6.—TRANSVERSE VERTICAL SECTIONS OF FURNACE.

Rustless Iron Company are situated at Little Ferry, N. J., but a short distance from Jersey City, where there are furnaces for treating all kinds of iron and steel. They describe their process as especially adopted to wrought iron pipe for water conveyance, grate frames and fenders, architectural ironwork, ship work, culinary utensils, cast-iron soil pipe and plumbers' castings, etc.

TESTIMONIALS

FROM R. MCNAMEE & CO.,

NEW YORK, August 15th, 1887.

WELLS RUSTLESS IRON CO.

Dear Sirs:—With pleasure we reply to yours of the 13th inst., regarding the "Rustless" Iron Pipe we purchased from you last year. It has now been in use for nearly a year bringing water from a spring a mile away from Kaolin, S. C., where our works are situated. The water is used by our hands for drinking, cooking and household purposes generally. Our superintendent reports it as in every way satisfactory, and gives as a proof of the purity of the water after passing through the pipe that rice boiled in it remains unstained.

Yours very truly

R. MCNAMEE & CO.

JANUARY, 1889.—We still believe the Wells Rustless Pipe to be the best pipe in the market for conveying water.

R. MCNAMEE & CO.

HARDWICKE & WARE,

Iron and Brass Founders, Machinists, &c., Oil and Salt Well Supplies, Iron Pipe, Fittings, Valves, &c.,

BUFFALO, N. Y., January 21st, 1888.

WELLS RUSTLESS IRON CO.

Gentlemen:—We had several of our Brine Pump Barrels, constructed with sockets, treated by your "Rustless" Process for use in the Salt Country, where considerable trouble had been experienced from an alleged electrical action, produced in some unaccountable manner between the brine and iron, causing frequent breaks. We tried the experiment in one well of using "Rustless" collars with very satisfactory results.

We continued the use in several other wells, and the former difficulty appears to have been entirely overcome. Sockets in use for six months show no change of any kind, and we believe "Rustless" salt tubing would be far more durable than the ordinary tubing now used.

Yours respectfully,

HARDWICKE & WARE.

GAS ENGINE & POWER COMPANY,

Manufacturers of Naphtha Engines for Marine Purposes,

NEW YORK, September 26th, 1887.

WELLS RUSTLESS IRON CO.

Gentlemen:—We take pleasure in stating that the cylinder chest, or casting of our Naphtha Engine, which you treated with your "Rustless" Iron Process, has been put to the test and found in every way satisfactory. We placed the casting in salt water for ten days, and, on taking it out, found it perfectly free from rust, and as bright as when placed in the water. This was tested four months ago, and since then has been in use in our factory, and there is no sign of rust as yet.

Yours truly,

GAS ENGINE & POWER CO.

H. T. VULTÉ, PH. D. F. C. S.,

Chemical and Sanitary Engineer,

NEW YORK, March 2d, 1888.

WELLS RUSTLESS IRON CO.

Gentlemen:—After using the Wells Process Pipe for two years for conveying hard and soft water and gas in clay soil and sand, as well as for the plumbing supply of my own residence, I can say that it has given perfect satisfaction. I have used about 2,500 feet in all, and shall continue to use it in preference to any other kind of pipe for water or gas. A pipe which I took up last fall, having been buried for about one year, and unused

during all that time, showed no signs of rust inside or outside; this same pipe is now doing service as water supply pipe to one of my houses. In a house which I am now about completing, I am putting in your pipe throughout. Very truly yours,

H. T. VULTÉ, PH. D.

HACKENSACK WATER CO., REORGANIZED.

HOBOKEN, N. J., February 2d, 1888.

WELLS RUSTLESS IRON CO.

Gentlemen :—Replying to your favor of the 1st inst., I would say that during the last year this company has had occasion to use considerable of your "Rustless" Pipe in very exposed positions. I consider the treatment far superior to that of galvanizing, and our experience with the pipe after treatment has been satisfactory. Yours respectfully,

HACKENSACK WATER CO.,

CHAS. B. BRUSH, Chief Engineer and Sup't.

EDWIN A. JACKSON & BRO.,

The Jackson Heat-Saving and Ventilating Grate,

New York, February 10th, 1888.

WELLS RUSTLESS IRON CO.

Gentlemen :—For several years we have been selling in our trade a large number of grates that have had the "Rustless" treatment at your works. This finish has been steadily growing in popularity as one that is unchangeable under exposure, either to heat or moisture. We are, Very truly yours, &c.,

EDWIN A. JACKSON & BRO.

GEORGE SUCH,

Fine New Jersey Clays,

SOUTH AMBOY, N. J., February 15th, 1888.

WELLS RUSTLESS IRON CO.

Dear Sirs :—The seventeen hundred feet of iron pipe I had from you is giving me great satisfaction. So far, the water running through it shows no signs whatever of rust. It is quite as good as I expected, and, in fact, I may say it is much better than I expected.

Yours truly,

GEORGE SUCH.

HIGHLANDS, N. C., January 11th, 1889.

WELLS RUSTLESS IRON PIPE CO.

Dear Sirs :—I have pleasure in saying that I laid 600 feet of your rustless pipe, 2 years ago, to carry water from a spring to my dwelling It has done this perfectly without any rust appearing inside or outside, nor with any rust where it is immersed in the water of the spring or where it is exposed to the air in places. There is not the slightest taste in the water which comes perfectly pure and free from all taint of iron or sediment of rust. One spare length of pipe has laid in the grass near the spring since January, 1887, and it has not a stain of rust upon it, being as clean and bright as when left there. HENRY STEWART.

CINCINNATI, February 11th, 1889.

WELLS RUSTLESS CO.,
21 Cliff Street, New York.

Gentlemen :—All the Architectural Iron work that you have oxidized for me has been satisfactory in every respect.

Very respectfully,

M. CLEMENTS,
per W. L. C.

Extract from *The Metal Worker*, February 9th, 1889.

IS RUSTLESS IRON PIPE DURABLE?

Mr. Solon F. Smith, superintendent of the Grafton Water Works, Grafton, Mass., writes us as follows on the subject of rustless iron pipe: In *The Metal Worker* of January 12 "A. W." says he will be very slow to accept anybody s testimony in relation to rustless iron pipe; so what I have to say will probably have no bad effect on him. I commenced using the Wells rustless iron pipe January 1, 1887, and up to this time I have used 17,000 feet, and I have never had to make any repairs, except when the pipe froze. It gives the best results of any pipe we have ever used in the ground, and we employ it altogether for our service-pipe. I have cut out a piece after it had been in the ground ten months, carrying a water pressure of 155 pounds to the square inch, and it was as free from rust, both inside and outside, as when it was laid. I do not mean to say that the pipe is perfect and that it will not rust under some circumstances and in some localities, but with us it works, so far, as we could wish, We did not commence the use of the rustless iron pipe until we had consulted a number of manufacturers and corporations who were using it, and in every case they thought that it was the best they had found yet. There are a great many water-works and factories using this pipe in Massachusetts, and I think it would be well if we could have a letter from such, as I would like to know if we are the only ones who have found it a success.