J. A. JONES.

Manufacture of Iron and Steel.

No. 225,932 Patented Mar. 30, 1880.

Fig. 1.

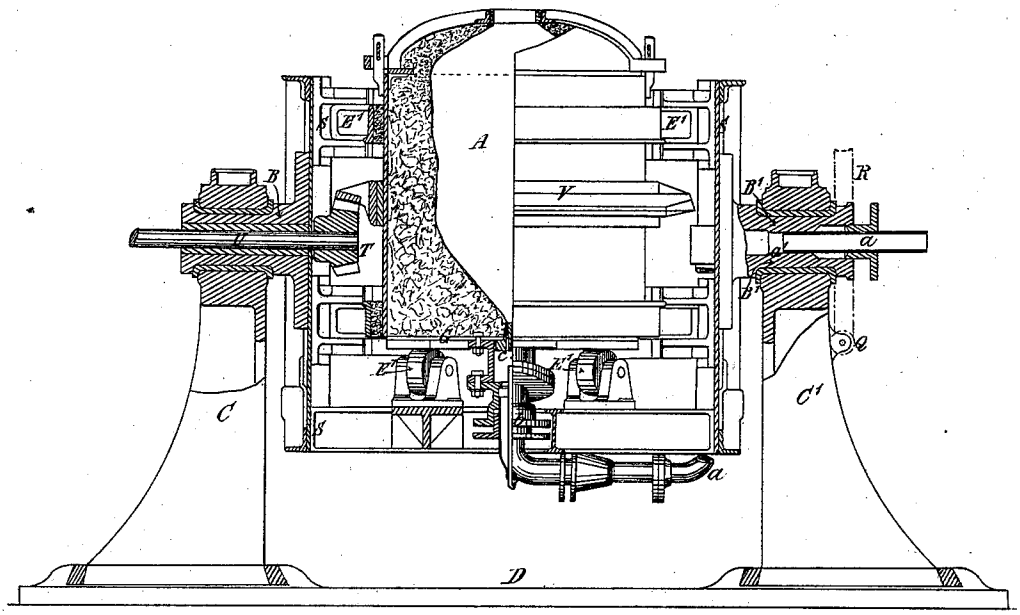
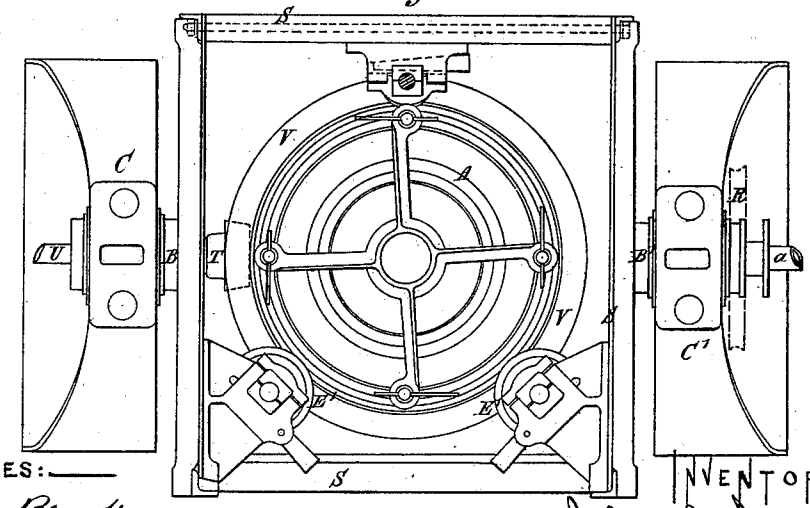


Fig. 2.



WITNESSES:—

W. C. Brookes

Chas. C. Stetson.

INVENTOR:—

John A. Jones

by his attorney C. C. Stetson

N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

JOHN ALLCOCK JONES, OF MIDDLESBROUGH, GREAT BRITAIN.

MANUFACTURE OF IRON AND STEEL.

SPECIFICATION forming part of Letters Patent No. 225,932, dated March 30, 1880.

Application filed September 12, 1878. Patented in England, October 12, 1876.

To all whom it may concern:

Be it known that I, JOHN ALLCOCK JONES, of Middlesbrough, in the county of York, Kingdom of Great Britain and Ireland, have invented new and useful Improvements in the Manufacture of Iron and Steel, of which the following is a specification.

In the refining of iron and steel by means of a blast of air, alone or in connection with chemicals or substances rich in oxygen, it has been customary heretofore to transfer or run the metal thus treated into a separate vessel for puddling the same mechanically or otherwise.

In order, however, to purify iron by air-blast, and also to form a ball thereof in the same vessel, it has been proposed to employ a cylindrical vessel which rests in a horizontal position, and to simultaneously agitate and blow air through the metal therein, the agitation being effected by rocking the vessel through suitable mechanism; but this involves difficulties which my invention avoids. I force air through the metal and puddle it in the same vessel at different times. I perform the blowing while maintaining the vessel in an upright position, and the puddling when said vessel is turned upon its side. Both operations may thus be performed in the same vessel without interfering one with the other, under the conditions heretofore found most efficient in carrying out the treatments in separate vessels.

Molten metal is introduced into a suitably-lined operating-vessel properly heated. A blast is introduced into and through the molten metal while the vessel is in a vertical or nearly vertical position. When the ingredients to be eliminated have been removed the vessel is tilted to a horizontal position and revolved to complete the process; or the above process may be reversed. The rotating part may come first, and after a portion of the ingredients are removed it may be brought into a vertical position and blown, and then rotated horizontally again to shape it into a ball or run it out as refined iron.

The apparatus that effects these objects may be much varied. I have used several forms. One that I have found successful is represented in the accompanying drawings, in which—

Figure 1 is a section through the apparatus while upright, and Fig. 2 a view of the same when turned down to act as a puddler.

A is the vessel in which the iron is refined and puddled. The framing S, carrying this vessel, is mounted, by means of trunnions B B′, in standards C C′, and is actuated so as to cause the vessel to assume a vertical position or a horizontal position, as required, by means of a worm, Q, carried by the standard C′ and gearing into a worm-wheel, R, keyed on the trunnion B′.

Air is admitted to the interior of the vessel A through a pipe, *a*, passing through the trunnion B′ and fitted with union-joints *a′* and *b*, for conducting the air to the tuyere brick or perforations *c* in the end or bottom G of the vessel.

When the vessel is in a horizontal or approximately horizontal position it is caused to revolve by means of a bevel-pinion, T, keyed onto the inner end of a horizontal shaft, U, and gearing with a bevel-wheel, V, keyed onto the body of the vessel A. The shaft U passes through the trunnion B, and is actuated from any suitable prime mover by means of a driving-belt or by gearing, as found most convenient.

In carrying out the process of refining and puddling with this apparatus the chamber or vessel A is first lined with a mixture of oxide of iron, oxide of manganese, nitrate of soda, or other suitable substance or substances containing oxygen, or with oxide of iron alone, and is then heated by any convenient means, and air is admitted, when the vessel is in either a horizontal or vertical position, through the pipe *a*, union-joints *a′* and *b*, and through the tuyere brick or perforations in the end or bottom G of the vessel; after which the vessel (either remaining in or being brought into a horizontal position, as the case may be) is charged with molten metal, (supplied thereto from a blast-furnace, cupola, air, or other furnace.) The molten metal having been introduced, the vessel is brought into a vertical position, and is then blown by continuing to force air through the tuyere brick or perforations in the end or bottom G of the vessel, whereby some of the metal ingredients—such, for example, as carbon and silicon—which it is

desired to eliminate, or portions of the same, are removed, the temperature being at the same time increased.

The vessel may be rotated first and blown afterward, and then rotated again.

If additional heat is required, oil or gas may be injected with the blast through the tuyere brick or perforations. After the ingredients which it is required to eliminate have been removed the vessel A is tilted into a horizontal position, so as to bear upon the rollers E′. The vessel is then caused to revolve, whereby the metal is agitated and mixed among the cinder contained in the vessel (part of which cinder is obtained from the lining) until the metal mixed with the cinder is formed into a ball in readiness to be hammered or squeezed into any desired shape. At this latter stage of the process, if further heat is necessary, carbureted gas or oil may, in combination with air, be injected through the tuyeres.

To produce steel by my combined blowing and rotative process I proceed as follows: The apparatus being in a vertical position, air under pressure is blown through the metal and a portion of the carbon and silicon removed. The vessel is then rotated in a horizontal position and the phosphorus or a part of it removed. The metal is now rehabilitated with carbon and silicon by adding to it iron or other metal specially charged with carbon and silicon, and the metal is again blown into steel.

The above process may be reversed—that is, the rotative part may come first and the phosphorus and silicon, or a part of them, be removed, after which the carbon and silicon may be added, and the material afterward blown and converted into steel. The object is by this process to utilize such metal or iron holding phosphorus as cannot be used by and is unfit for the ordinary Bessemer process. The rotative process will remove both silicon and phosphorus.

I would have it understood that I do not claim separately the process of conversion by blowing, or the process of puddling in a revolving vessel; and it will be manifest that the essential feature of my invention does not consist of a mere form of machinery, and that there may be many variations of the same, still using my new method or process.

I claim as an improvement in the production of refined iron and steel—

1. The within-described mode of purifying and puddling iron and steel by melting it and alternately blowing air through it, and mechanically agitating or puddling it, the two operations being performed at different times in the same vessel, substantially as herein specified.

2. The process of manufacturing wrought-iron and steel herein described, which consists in subjecting the molten metal in a suitable vessel to a blast of air from below, said vessel being maintained in an upright position, and then subjecting it to a mechanical agitation by revolving the containing-vessel to puddle the metal while the vessel is in a horizontal position, as and for the purposes herein specified.

JOHN ALLCOCK JONES.

Witnesses:

ALBERT H. SANDERSON,
Middlesbrough.

JOHN THOMAS, Jr.,
Middlesbrough.