W. SWINDELL.

Rotary Puddling-Furnace.

No. 219,604. Patented Sept. 16, 1879.

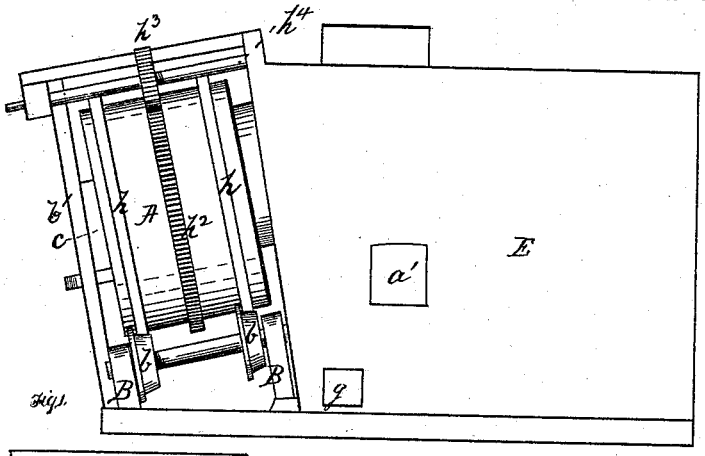

Fig. 1.

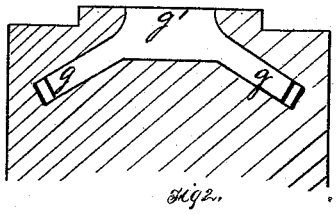

Fig 2.

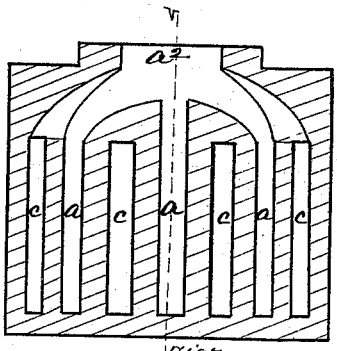

Fig 3

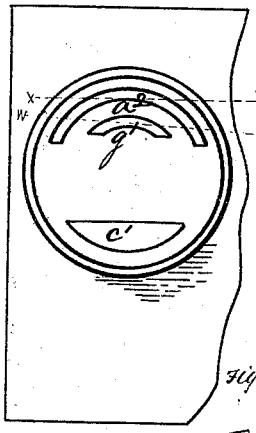

Fig 7

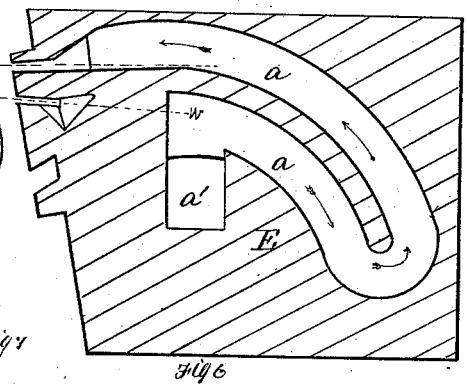

Fig 6

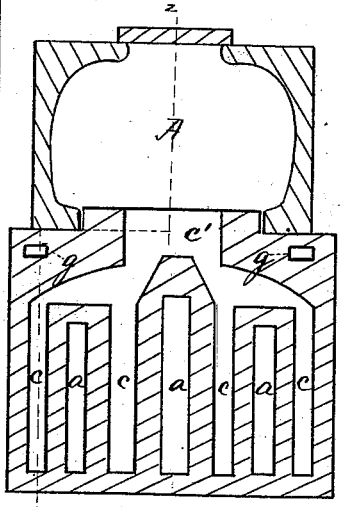

Fig 4.

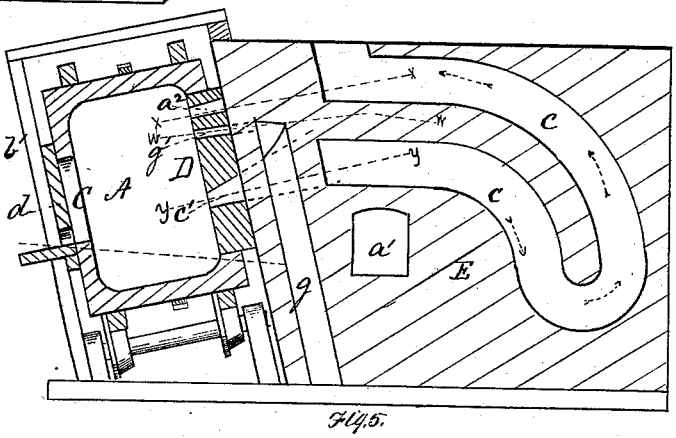

Fig 5.

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UNITED STATES PATENT OFFICE

WILLIAM SWINDELL, OF ALLEGHENY, PENNSYLVANIA.

IMPROVEMENT IN ROTARY PUDDLING-FURNACES.

Specification forming part of Letters Patent No. **219,604**, dated September 16, 1879; application filed July 14, 1879.

To all whom it may concern:

Be it known that I, WILLIAM SWINDELL, of Allegheny, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Rotary Puddling-Furnaces and Regenerators Therefor; and I do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a side elevation of devices embodying my invention. Fig. 2 is a detail horizontal section on the line *w w*, showing the gas flues or inlets and discharge. Fig. 3 is a similar section on the line *x x*, showing the hot-air and waste-gas flues and air-discharge. Fig. 4 is a like section on the line *y y*, showing the hot-air and waste-gas flues and the waste-gas exit. Fig. 5 is a vertical section on the line *z z*, showing the products of combustion and gas-flues. Fig. 6 is a similar section on the line *v v*, showing the hot-air flues leading to the rotary puddler. Fig. 7 is a view of the air, gas, and waste-gas flues at their point of delivery within the rotary puddler, the latter having been removed.

Like letters refer to like parts wherever they occur.

My invention relates to the construction of rotary puddling-furnaces and regenerators therefor; and consists, first, in a rotary puddler of general cylindrical form, with a working door at one end and a throat for the entrance of the working flame at the opposite end, said cylinder mounted at an angle on inclined rollers, so that one axial opening or the throat thereof may be enlarged to an extent equal to the interior diameter of the cylinder, if desired, whereby a full and free admission of the working flame and escape of the products of combustion are provided for; and, secondly, in combining with a rotary cylindrical puddler set at an angle upon inclined rollers, so as to obtain an enlarged throat for the entrance of the working flame and escape of the products of combustion, a regenerator having a series of arched air and waste-product flues alternating with each other, and by their form giving a curved projection to the flame to cause the same to impinge upon the hearth and the waste products to escape from the rotary puddler.

Heretofore the general construction of rotary puddlers has been such that the diameter of the barrel necessarily greatly exceeded the diameter of the axial opening or throat in order to obtain a hearth of sufficient depth to contain a fair-sized charge or to work with advantage, as the barrel was rotated on a horizontal axis.

To overcome this objection the form of the rotary puddler has in some instances been converted from a barrel shape to that of a flattened sphere, which, while it increased the capacity of the hearth and also that of the throat of the puddler somewhat, yet rendered the devices less readily rotated without the use of somewhat complicated machinery, which is always an objectionable feature in large metallurgic operations, where the devices are subject to both high heat and great weights or strains.

In those instances where the flame or its equivalent enters at one end, while the products of combustion escape at the other, the small size of the throat is not so material; but in that class wherein the flame enters and the products of combustion leave the rotary hearth on the same side, as in the cases where regenerators are used, or wherever the flame is not to strike the metal direct, but to curl or sweep over it, the size of the throat or axial opening of the puddler is very material.

The object of the present invention is to simplify the construction, or rather to retain the well-known and simple method of mounting the rotary puddler, and at the same time materially increase the axial opening or throat thereof without diminishing the capacity of the hearth or increasing materially the diameter of the barrel.

I will now proceed to describe my invention, so that others skilled in the art to which it appertains may apply the same.

A indicates the rotary puddler, which in its general construction may be of any approved construction or of the usual pattern—that is to say, of cylindrical form, lined on the inte-

rior with a suitable fix, and having upon its exterior rings or hoops h, which retain it in position on rollers b, and cog-ring h^2, gearing with a cog-wheel, h^3, on a power-shaft, h^4, by means of which the cylinder A is rotated. Instead, however, of placing the cylinder A in a horizontal position, it is inclined somewhat, as shown, and the rollers b, upon which it rests and rotates, are correspondingly set in their fixed frame B.

C indicates a contracted opening in the axis of the cylinder, through which the charge may be inspected and treated from time to time, and the puddle-ball withdrawn at the termination of the process. This opening is closed by a small door, d, which may slide between the end of the rotary puddler A and the upright b', or may be secured in any other well-known and convenient manner.

The cylinder A being set at an angle, and the opening at C being comparatively small, gives a deep hearth for the metal under treatment, as indicated by the dotted line, Fig. 5; and it will be observed that with every increase in the diameter of the cylinder a proportionate increase in the capacity of the hearth follows.

In the opposite or flue end of the rotary puddler A is a large opening, D, for the introduction of the flame and the escape of the products of combustion, and as, in the rotation of the cylinder A, the tendency of the metal is always to sink away from this end of the cylinder, said opening D may be, if desired, almost coextensive with the internal diameter of the cylinder, thus affording a free and unobstructed ingress for the flame and egress for the products of combustion.

In connection with a rotary puddler, preferably such as specified, I employ gaseous fuel and a regenerator having the following construction: E indicates the regenerator, which is built with a series of flues, $g\ a\ c$—those indicated by the letter g being for the admission of gas, and consisting of two or more short flues located near the forward part of the regenerator E, which converge and unite near the gas-discharge orifice g', which is preferably narrow and long, so as to spread out the gas and deliver it in a sheet below the air-discharge orifice. $a\ a$ indicate the air-flues, and $c\ c$ the flues for the escape of the products of combustion. These flues are arranged alternately, are of the same general form, and occupy relative positions in the regenerator.

The air-flues a communicate with the outer air by means of, and receive their air-supply through, a transverse port, a^1, common to all of said flues, and from this point the flues arch down and back to the rear of the regenerator, where they double and arch forward, forming return-flues that finally unite in a common delivery-port, a^2, which is long and narrow, so as to spread out the air into a sheet and deliver it into the throat D of the puddler at a point over the gas-inlet, so that the gas and air may intermingle thoroughly, to insure perfect combustion. The course of the air is indicated by full-line arrow.

The products of combustion escape from the rotary puddler or cylinder on the same side as the flame enters, and through a throat, c', which communicates with each of the several waste-gas flues c. These flues c for the waste products, starting from the common port g' at the throat E, first arch or dip down and back, and then, doubling, arch forward and upward, finally uniting in a common flue, which delivers into the stack.

Throughout their entire course the air and gas flues are arranged side by side, and the incoming air and outgoing waste gases travel in the same direction, so that the waste gas at its highest temperature and the air at its lowest temperature impinge upon opposite sides of the same wall, which not only serves to uniformly heat the air, but to protect the walls of the regenerator. The dotted-line arrow indicates the course of the products of combustion.

The above-described devices or their equivalents will operate as follows: The air which enters the flues a from port a^1 will travel downward and backward through flues a and then upward and forward to the delivery-port a^2 upon one side of the intervening walls, while the products of combustion, leaving the hearth by flues $c'\ c$, will travel in the same direction on the opposite side of the said walls. The gas which, coming from the producer, has entered through flues g will spread out in the port g' and be delivered in a thin sheet below the sheet of air entering the cylinder from a^2, and the two intermingling will inflame, and, sweeping down over the metal contained in the lowest part of the cylinder, the products of combustion will enter port c', and, having traversed flues c, will escape through the stack.

The advantages of my invention are, first, that the simplicity of the construction of the rotary puddler is retained, and at the same time the axial opening or throat is increased without necessarily increasing the diameter of the cylinder; secondly, a deep hearth is obtained, thereby increasing the capacity of the rotary puddler; thirdly, the top of the rotary cylinder, being inclined, will act as a deflector for the gas, air, and flame; fourthly, a regenerator can be employed to advantage with a rotary puddler; and, fifthly, the waste heat of the products of combustion can be utilized to the greatest advantage.

Having thus set forth the nature, operation, and advantages of my invention, what I claim, and desire to secure by Letters Patent, is—

1. A rotary puddler of general cylindrical form, provided at one end with a working door and having at the other an enlarged axial opening or throat for the admission of the working flame and the escape of the products of combustion, said puddler set at an angle upon its rollers, whereby an enlarged axial

opening or throat is obtained without decreasing the capacity of the hearth, substantially as specified.

2. The combination, with a rotary puddler mounted at an angle upon inclined rollers and having a working door at one end and an enlarged axial opening or throat at the other, of a regenerator having a series of arched air and waste-product flues arranged side by side and alternating one with the other, said flues connecting with the throat or enlarged axial opening of the rotary puddler, substantially as and for the purpose specified.

In testimony whereof I, the said WILLIAM SWINDELL, have hereunto set my hand.

WILLIAM SWINDELL.

Witnesses:
JNO. K. SMITH,
A. C. JOHNSTON.