A. J. MOXHAM.

PROCESS OF CONVERTING IRON SCRAP INTO BARS.

No. 193,540. Patented July 24, 1877.

Fig. 2.

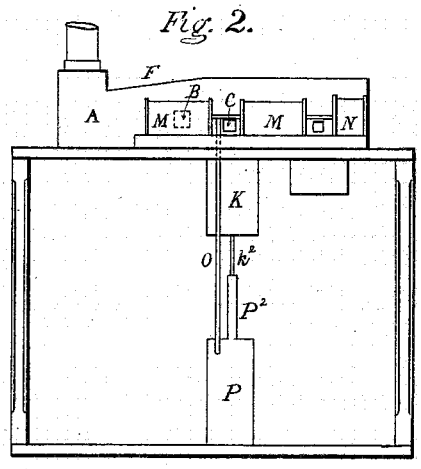


Fig. 4.

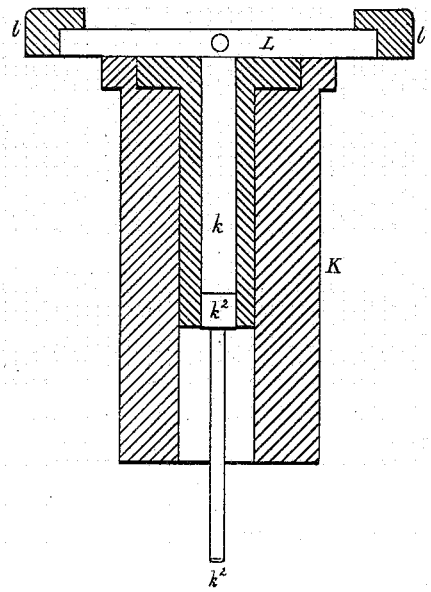


Fig. 1.

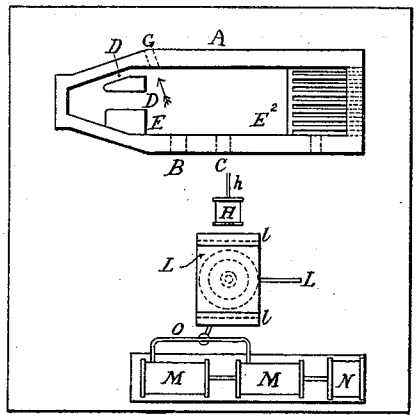
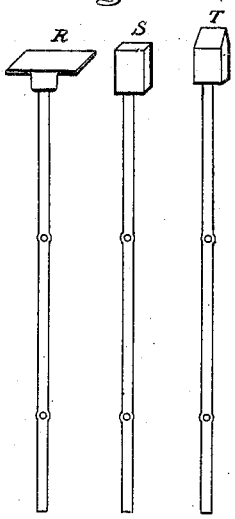


Fig. 3.



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ARTHUR J. MOXHAM, OF LOUISVILLE, KENTUCKY.

IMPROVEMENT IN THE PROCESSES OF CONVERTING IRON SCRAP INTO BARS.

Specification forming part of Letters Patent No. **193,540**, dated July 24, 1877; application filed December 5, 1876.

To all whom it may concern:

Be it known that I, ARTHUR J. MOXHAM, of Louisville, in the county of Jefferson and State of Kentucky, have invented certain new and useful Improvements in the Art or Process of Reconverting Wrought-Iron Scrap into Merchantable Iron, of which the following is a specification:

This invention relates to the art of reconverting wrought-iron scrap into merchantable iron; and consists in an improved process therein, as fully illustrated by means hereinafter described, reference being had to the drawings forming part of this specification.

The object of this invention is to dispense with the ordinary intermediate stage of making "muck-bars" of rolled scrap, which bars it is customary to pile and reheat, and then to pass the hot pile through forming-rolls for desired shapes. In order, therefore, to accomplish the said object, the scrap is first forged or welded into a bloom within a furnace of peculiar form, and provided with suitable tools for performing the necessary operations therein. The bloom so formed is then removed from the furnace and subjected to hydraulic or other great pressure, when, without reheating said bloom, it is ready for immediate rolling, if desired, into any required shape. By this process not only is the operation of conversion rendered more simple—fewer manipulations being required—but there is less waste of material, there being no unwelded ends of muck or pile bars to be cut off. Reheating of the metal is also dispensed with, if desired, the converted iron is denser and more homogeneous in structure, and the merchantable product can necessarily be placed upon the market at a cheaper price than any iron converted by passing from the furnace through the ordinary fining-machines used in the conversion of cast or pig iron into merchantable wrought-iron.

In the accompanying drawing, Figure 1 is a plan of the plant with the top of the furnace removed. Fig. 2 is a side elevation of the plant; and Figs. 3 and 4 illustrate tools and parts, hereinafter described, required in the several stages of the process.

Like letters in the several figures indicate the same parts.

A is the furnace provided with an ordinary grate, bridge-wall, fire-door, and chimney. The said furnace is oblong in shape, but narrows at one end toward the chimney. B is the charging-door, and C the door for the manipulation of the scrap and the withdrawal of the welded or forged bloom. Another door or doors may be provided for the latter purpose, if desired. D D are flues—one central, the other lateral—in order to draw the heated gases over to one side of the welding-chamber. The space E^2 between the bridge-wall of the furnace and the door C is the welding-chamber, and the space E between the door B and the flues D D is the heating-chamber. The top of the furnace inclines downward toward the chimney, as seen at F, for the purpose of causing the heat to reverberate upon or into the welding-chamber E^2, and the bottom of the furnace is inclined, as seen at G, at which point the cinder is discharged out of the furnace. H is a steam-cylinder provided with a piston-rod, *h*, to which the welding and forging tools are attached when it is desired to forge the bloom within the furnace by steam-power, the steam-cylinder for such purpose being operated much like a steam-hammer. K is a flask or mold, within which the bloom is to be compressed immediately after removal from the furnace A. The flask K has within it a smaller flask, *k*, provided with a ram or plunger, k^2. Any desired number of such smaller flasks are used. While the external diameters of these smaller flasks all neatly fit the internal diameter of the large flask K, their inner diameters are made to vary according to the different-sized blooms desired to be compressed. When the largest-sized bloom is required, the large flask is used, the inner and smaller flask being removed. L is a stop or gate, which is placed upon the top of the flask within its guides *l l*, after the insertion of a bloom within the flask. The stop L receives the pressure exerted upon the bloom within the flask. When one of the smaller flasks is removed from the large one a collar is inserted in the counter-sink at the top of the large flask under the stop L, in order to prevent any offset from being formed upon each large bloom when compressed. M M are steam-pumps actuated by the steam-cylinder N, and con-

nected by suitable pipes O to a hydraulic cylinder or ram, P, containing a piston and rod, P^2. It is evident that these pumps can be made to exert any desired pressure within the cylinder P. R S T are the tools for manipulating the scrap within the furnace A. These tools are guided by the hands of an operator, but are attached to and operated by the steam-engine H when desired. R is the former for shaping the bloom. S is the hammer-head for assisting in the same operation, and T is a chisel or knife for cutting the bloom to any desired length.

Having the plant constructed as thus described, the *modus operandi* in the conversion of the scrap is as follows:

The furnace A being at the desired temperature, and the scrap scattered over the two chambers E E^2, that portion of the scrap in the welding-chamber E^2 is subjected to the operation of the forging tools while the other portion of the scrap in the heating-chamber E is being heated. As soon as the bloom is thus made of the required size in the welding-chamber E^2 it is withdrawn therefrom and subjected to the operations presently to be described. As soon as the welding-chamber E^2 is cleared the scrap in the heating-chamber E is raked into the welding-chamber, the heating-chamber recharged and the welding of another bloom commenced, and thus this part of the process continues.

Instead of loosely scattering the scrap in the furnace A, it may be placed therein, if desired, inclosed within a box of fagoted muck or other bar-iron, and then be subjected to the process herein described.

This and other methods of fagoting scrap are well-known expedients, but both the object and expense of such fagoting are rendered unnecessary by this process.

The hot bloom just taken from the furnace A is next pushed down into the flask K, and the stop L closed over it. The pumps M M being then put in operation, actuate the ram P^2, provided with a collar-head suited to the internal diameter of the large flask, if used, but acting directly upon the rod k^2 within one of the smaller flasks, if one of said flasks be used. The ram P^2 thus compresses or condenses the bloom within any one of the flasks to any degree desired. The pressure upon the bloom being for a moment relieved, the stop L is removed, when the pressure being again immediately applied the bloom is ejected from the flask still hot enough to be immediate hot-rolled or forged into any desired shape or form.

The bloom may, however, be kept until cold, and then be either cold-rolled, or be transported to another locality and reheated there for rolling or forging, when desired.

By making suitable connections with the furnace A the flask K may be kept at any desired temperature by making use of the waste products of combustion to keep the flask hot, and thus prevent it from possibly chilling the bloom.

Instead of hydraulic pressure, any other pressure may be substituted, as that of a lever or screw, or some form of squeezer may be substituted for the condensing-flasks.

A special form of squeezer, suited to this process, has been already invented by me, which I reserve as the subject of an application for other Letters Patent. I do not therefore confine myself to the precise forms, nor to the precise relative arrangements, of the furnace and other parts of the plant herein described, for it is evident that such forms and arrangements may be greatly varied without departing from the principle underlying this invention. Indeed, it is evident that, by using an ordinary squeezer for condensing the hot-balls of scrap just out of the furnace, and then running the squeezed iron through ordinary muck-rolls in sufficient mass, a bar of iron large enough for some purposes can be obtained, which, after reheating, can be worked, without piling, into the desired shape. This operation would somewhat cheapen the ordinary process, and require no new plant, but the field for the use of the iron, if so made, is limited, its cost would be greater, and the quality of the iron would not be equal to that condensed by the special process herein described.

It is evident that any iron of sufficient purity may be subjected, after being puddled, to the process herein described for welded scrap, and with equally advantageous results.

I do not herein claim any special part of the several parts of the plant invented by me, and described herein, as I reserve all such devices for subjects of other applications for Letters Patent.

Having thus fully described this improvement in the art above mentioned as of my invention, I claim—

The hereinbefore-described new process of directly converting wrought-iron scrap into merchantable iron without subjecting the iron to the ordinary muck process, consisting of first forming the scrap within a furnace into a suitable bloom, then removing said bloom therefrom and subjecting it to hydraulic or other pressure, in the manner described, whereby a condensed bloom is formed and prepared for immediate conversion into bar or other shaped iron, as may be required.

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