J. Park. Jr,

Manf. Plates of Combined Iron & Steel.

No. 78,477. Patented July 2. 1868.

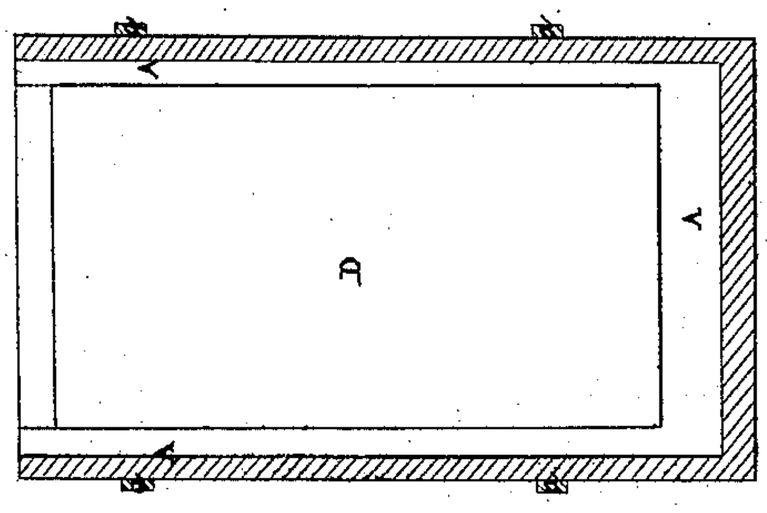

Fig. 2.

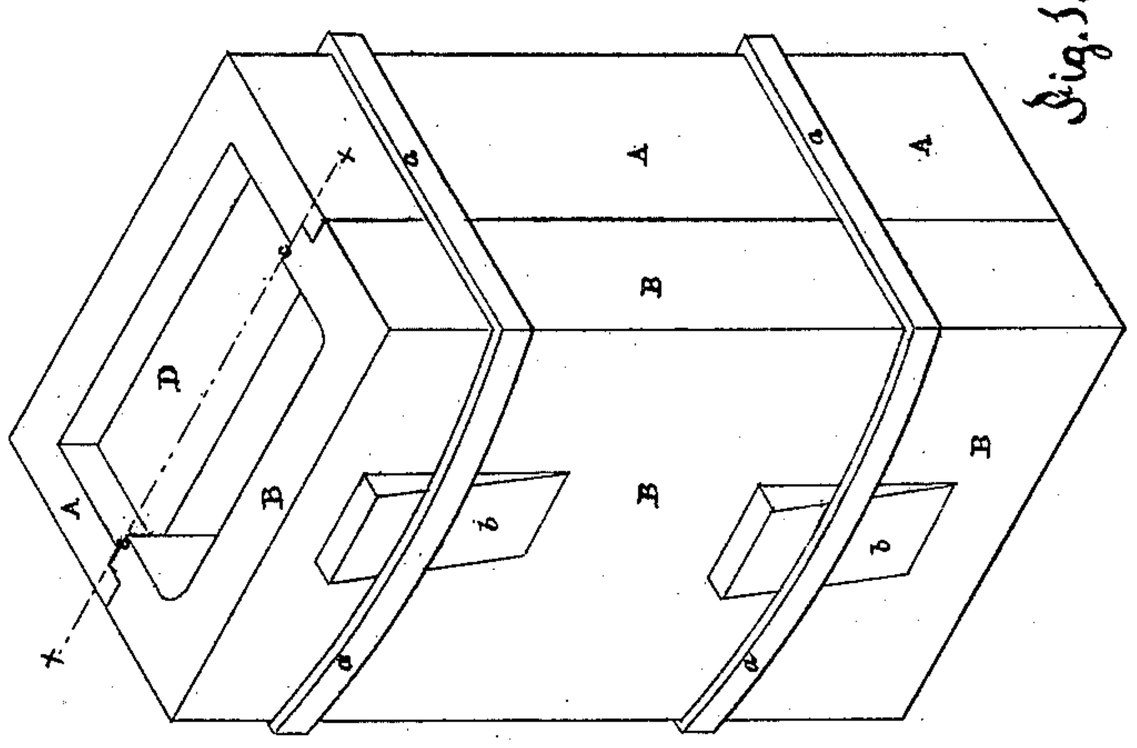

Fig. 3.

Witnesses:
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United States Patent Office.

JAMES PARK, JR., OF PITTSBURG, PENNSYLVANIA.

Letters Patent No. 78,477, *dated June* 2, 1868.

IMPROVEMENT IN THE MANUFACTURE OF PLATES OF COMBINED STEEL AND IRON.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, JAMES PARK, Jr., of the city of Pittsburg, in the county of Allegheny, and State of Pennsylvania, have invented a new and useful Improvement in Manufacture of Metal Plates of Combined Steel and Iron; and I do hereby declare the following to be a full, clear, and exact description thereof.

It is very important, for various purposes in the arts and manufactures, to produce plates or sheets of metal which shall combine the hardness and susceptibility to polish, and tempering qualities, of high-tempered steel, with the toughness, strength, and susceptibility to formative action of dies or swages possessed by wrought iron and other soft fibrous metals. Thus, in the manufacture of ploughs, it is desirable to have the hard, highly-polished, and durable surface which can be given to high-tempered steel, and which the softer or lower-tempered steel, such as German or blister steel, will not take. But high-tempered steel plates cannot be moulded into shape, and must be moulded before being tempered, but will warp and crack in the tempering or hardening process.

In the manufacture of fire and burglar-proof safes, it is highly important that the metal plates of which they are composed should not only be smooth and even in surface, but also so hard as to resist the action of boring and cutting-tools, and so tough and strong as not to be cracked or broken by blows from a sledge-hammer.

Such requirements are impossible to be fulfilled with the use of ordinary cast or wrought steel, so that the plates are sure to be either so brittle as to be readily fractured, or so soft as to be easily cut or drilled, and in either case the tempering process employed to harden the steel is liable to warp the plates, and render them useless for the required purpose, as they cannot be brought back to shape after having been hardened.

In order to prevent the steel plates from cracking or breaking in the hardening process, it is necessary to use steel of a comparatively low, mild, or soft temper, but such steel cannot be hardened sufficiently to resist the tools of the burglar. If, on the other hand, high-tempered or hard steel is used, such as is susceptible of a high degree of hardness, the plates are so brittle as to be unable to resist the force of blows which will readily shatter the safe to pieces.

In hardening the steel plates, they are very apt to warp or crack, and become so misshapen as to be unfit for use, or, if they had been previously moulded into any required shape by dies or otherwise, the tempering process will cause them to change their form, which cannot be restored or the plates straightened without being softened, and thus rendered useless for the purpose intended.

In casting molten steel against a heated slab of wrought iron, there is no difficulty in forming a plate or ingot which shall be susceptible of being rolled or hammered out into plates possessing externally all the hardness of the best cast steel, combined with greater toughness and strength than is possessed by the softest kinds of steel, such as German or blister steel. But a difficulty still occurs, in the fact that when the molten steel is cast around the heated slab of wrought iron, the carbon of the steel penetrates the iron, carbonizing it to such a degree as to impair its toughness and strength, and render it more brittle than good wrought iron.

In order to secure plates for the construction of safes, plough-plates, and other purposes, possessing the requisite degree of toughness with the greatest exterior hardness, I have invented a mode of manufacturing plates of combined steel and iron, which accomplishes the desired result.

To enable others skilled in the art to use my invention, I proceed to describe the process which I employ.

In the accompanying drawings—

Figure 1 is a perspective representation of the mould which I use for forming the steel and iron slabs.

Figure 2 is a section of the mould through *x x*, fig. 1.

The mould which I use for casting the steel on to the iron to form the slab is made of cast iron, divided vertically into two parts, A and B, which fit together with a related joint, and are held in place by bands *a a*, tightened by wedges *b b*, or otherwise, as may be most convenient.

The part or division of the mould is made in the plane of the face of the iron slab to which the steel is to be united.

The cavity of the piece A of the mould is a little wider across than that of the piece B, thus forming a shoulder on each side at *c c*, for the slab of wrought iron, D, to rest against when placed within the cavity of the piece A of the mould which it fills, the outer surface of the wrought-iron slab touching the inner surface of the piece A. The cavity of the piece B of the mould is to receive the melted steel.

The operation is as follows:

A slab, D, of good wrought iron, of the required size and shape to fit the piece A of the mould, is heated red hot, either on both sides or only on that side against which the steel is to be cast, and placed within the piece A, when the mould is shut, and melted cast steel of high or hard temper is turned into the cavity of the piece B of the mould against the surface of the red-hot piece of iron.

When the cast steel in the mould is sufficiently set, the bands *a a* are removed, the mould is opened, and the ingot is taken out.

As the steel is cast against one side only of the wrought-iron slab, the iron is carbonized, if at all, only on the side next the steel, the outer surface of the iron preserving its soft and fibrous nature.

The ingots, thus formed, are then removed to a furnace prepared to receive them, having openings of the size of the ingot, into which the wrought-iron side of the ingot is inserted, so as to expose it to the heat of the furnace, while the steel side is left outside of the furnace, and not exposed to the action of the fire. By this means these ingots are heated on their iron side to a red welding heat, while the steel side, which would be injured by the burning of the carbon at such a heat, is protected and kept comparatively cool.

Two ingots, each heated, as above described, on one side only, are placed together, with their heated iron sides in contact, the steel sides forming the outer surfaces, and the double ingot thus formed is placed within an ordinary heating-furnace until the whole mass is sufficiently heated to be rolled or hammered. As the wrought iron forming the inside of this double ingot was so much hotter than the steel, when placed in the heating-furnace, the iron is raised to a high welding heat before the steel has passed a safe heat, and the steel will have received no injury, when the whole mass is sufficiently heated to be hammered or rolled. The ingot is then removed from the furnace, and immediately subjected to the hammer, or passed between rolls, until the two pieces are perfectly welded together, and is, either with or without reheating, further rolled until it is reduced to the proper thickness required by the manufacturer.

In order to secure greater strength and toughness to the sheets, I sometimes heat a slab of wrought iron, of the requisite size and shape, to a high welding heat, and place it between two of the ingots, the iron surfaces of the two ingots, previously heated as before described, being placed in contact with the iron slab, which thus gives a central stratum of wrought iron, which has not been exposed to the danger of carbonization by the casting of steel against it. The ingot thus made is hammered or rolled, and reduced as before described.

In place of wrought iron, other malleable and fibrous metal may be used in the same way, but for ordinary purposes good wrought iron will be preferred.

By this process I have described, I secure sheets or plates of metal having a central stratum of tough malleable metal, and an outer skin or coating of steel of any desired hardness or temper, such as cannot be produced either by any ordinary process of welding, or by casting the steel on both sides of a wrought-iron slab, and then rolling it down to the proper thickness.

Plates, such as I have described, can be made so strong and tough, and at the same time so hard, as to be proof against either boring, cutting, or breaking, as the perfect union of the high-tempered steel with the wrought iron, or other soft and fibrous metal, prevents the separation of the steel and iron, and enables it to resist the blows of a sledge-hammer, while it is susceptible, before it is hardened, of being moulded by swages or dies, or hammered, and will retain the desired shape during the process of tempering without warping or cracking, the fibrous texture of the wrought iron or soft metal being preserved, as well as the hardness, impenetrability, and susceptibility to polish of the highly-tempered steel.

What I claim as new in my method of making ingots, plates, or sheets of combined cast steel and wrought iron, or other tough fibrous metal from ingots produced by casting high-tempered steel on one side only of a slab of wrought iron or other fibrous metal, is—

Giving a welding-heat to the iron or fibrous metal side only of the ingots, in the manner hereinbefore described, and then uniting these surfaces by welding them together, either with or without an interposed layer of wrought iron or other fibrous and malleable metal, substantially as hereinbefore set forth.

In testimony whereof, I, the said JAMES PARK, Jr., have hereunto set my hand.

JAMES PARK, Jr.

Witnesses:

A. S. NICHOLSON,

GEO. H. CHRISTY.