UNITED STATES PATENT OFFICE.

ALEXANDER WILSON, OF SHEFFIELD, COUNTY OF YORK, ENGLAND.

MANUFACTURE OF COMPOUND ARMOR-PLATES.

SPECIFICATION forming part of Letters Patent No. 362,806, dated May 10, 1887.

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To all whom it may concern:

Be it known that I, ALEXANDER WILSON, a subject of the Queen of Great Britain, residing at the Cyclops Works, Sheffield, in the county of York, England, steel-manufacturer, have invented certain new and useful Improvements in the Manufacture of Compound Armor-Plates, of which the following is a specification.

The object of this invention is to produce compound armor-plates with a very hard face and an extremely soft and tough back. To effect this I proceed as follows: I take a wrought-iron fibrous plate—say about fifteen inches thick—which has been previously built up from a number of thinner ones in the usual manner, and while hot from the rolls hammer or press and put it into a cast-iron or wrought-iron box or "mold." The mold is made internally of the proper length, breadth, and depth. The depth for the plate in question would be about twenty-eight inches. This would enable me to fuse onto the exposed surface of the "fibrous" iron plate a layer of "ingot-iron" about thirteen inches in thickness, thus forming a plate twenty-eight inches thick. I then take the plate out of the mold as soon as desirable and put it into a reheating-furnace, and after reheating it to the proper temperature I subject it to the action of a rolling-mill hammer or press until it becomes reduced to about eighteen inches in thickness. This is now what I term the "iron backing" of the compound plate. I then put it into the mold again, the depth of which can be easily altered, and then run or fuse onto the other side of the fibrous iron plate a layer of hard steel—say about eight inches in thickness. The plate is now in its rough state about twenty-six inches thick. I then take the plate out of the mold, and put it into the same or other reheating-furnace and expose it to the action thereof for a comparatively short time, after which I roll, hammer, or press the plate to the desired or finished thickness—viz., twenty inches. The plate is then allowed to cool. Afterward it is planed and otherwise machined to the proper form and dimensions.

It will be observed that I subject the "backing" portion of the plate to a great amount of mechanical manipulation and pressure to increase its strength and toughness before I fuse on the hard-steel "face." This I consider most important, as the latter portion of the plate can be made sufficiently hard to prevent penetration without its having to undergo any mechanical pressure or manipulation whatever, although in some cases I may prefer to do so, as in my former methods; and in order that my improvements shall be further understood, I may say that I make the ingot-iron, which I fuse onto the fibrous iron plate to form the backing, as soft and as low in carbon, or nearly so, as the best brands of Yorkshire irons, which, when rolled or hammered, will give a tensile strain of twenty-six to thirty tons per square inch, and the steel which I propose to fuse onto the fibrous iron plate to form the face I make of a very high temper—say containing from 1.25 to 1.5 per cent. of carbon, or thereabout, which will be very hard and will offer great resistance to penetration of projectiles. The ingot iron and steel can be produced by either of the processes commonly known as "Bessemer" and "Siemens-Martin." The center portion of the plate I make of the best puddled fibrous iron.

It will now be easily seen that I can produce a plate which will have a face as hard as can be planed or otherwise machined, which will enable it to break up any projectiles that may be fired against it and will resist the penetration thereof, while the back of the plate will be made tough and ductile, having also great tensile strength to enable it to better support the front layers of the plate, and by retaining the fibrous iron "core" or center portion I produce a plate which is not homogeneous, but stratified. Therefore any fractures or cracks which may be produced on the hard face of the plate by the impact of projectiles will not extend through the full thickness of the plate. This I also consider most important, as it is a well-known fact that homogeneous plates made wholly of steel or other hard metals, either in layers or otherwise, have this failing, and that all cracks produced on the surface by impact or otherwise do extend right through the full thickness of the plates, there being no fibrous strata to prevent it.

Although I have specified the various thick-

nesses and tempers of steel and iron layers of a twenty-inch compound plate made by this improved method, it must be understood that I do not bind myself thereto, as these may be varied without departing from my invention; but

What I claim as my improvements in the making of compound armor-plates is—

The process hereinbefore described of manufacturing armor-plates, consisting in taking a wrought-iron fibrous plate hot as it comes from the rolls or other forging apparatus and putting it into a mold and casting onto one of its faces a layer of soft ingot-iron, then taking the plate out of the mold, and after reheating and rolling, or otherwise forging it to reduce its thickness, placing it again into a mold and casting a layer of steel onto the opposite side to that which previously had the layer of soft ingot-iron cast onto it.

ALEXANDER WILSON.

Witnesses:

C. B. HOBBIS,

CHARLES RENSHAW,

Clerks to Messrs. Burdekin & Co., Solicitors, Sheffield.