(No Model.)

T. J. TRESIDDER.

MANUFACTURE OF ARMOR PLATE.

No. 529,050. Patented Nov. 13, 1894.

Fig. 1.

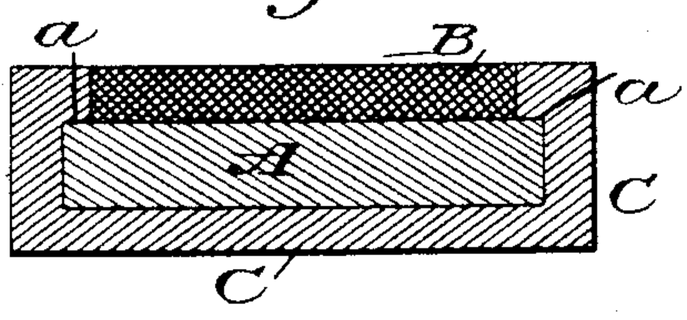


Fig. 2.

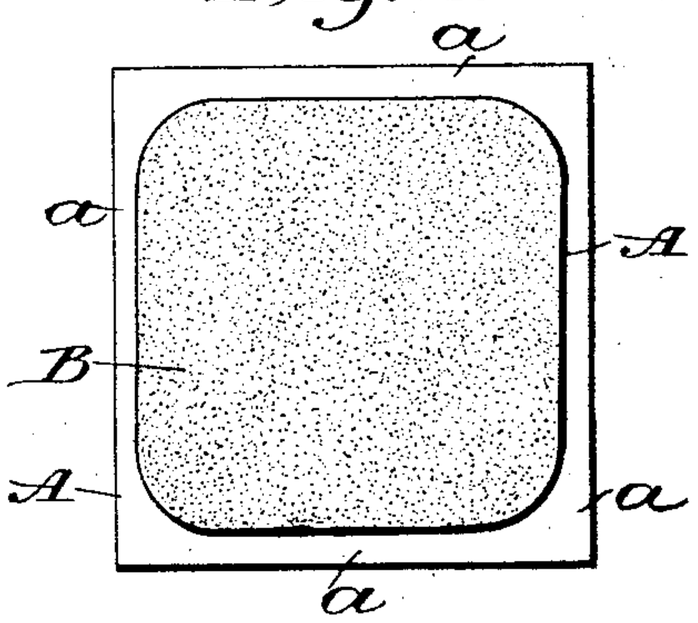


Fig. 3.

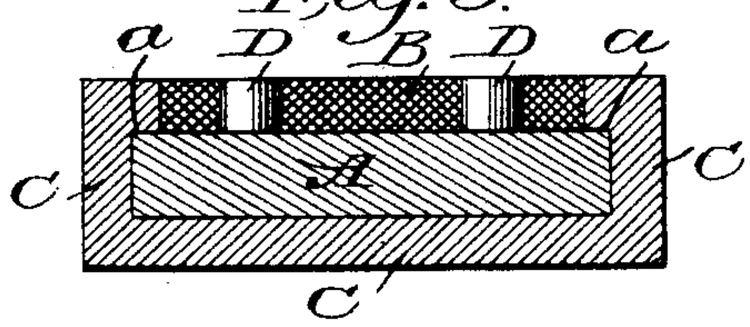
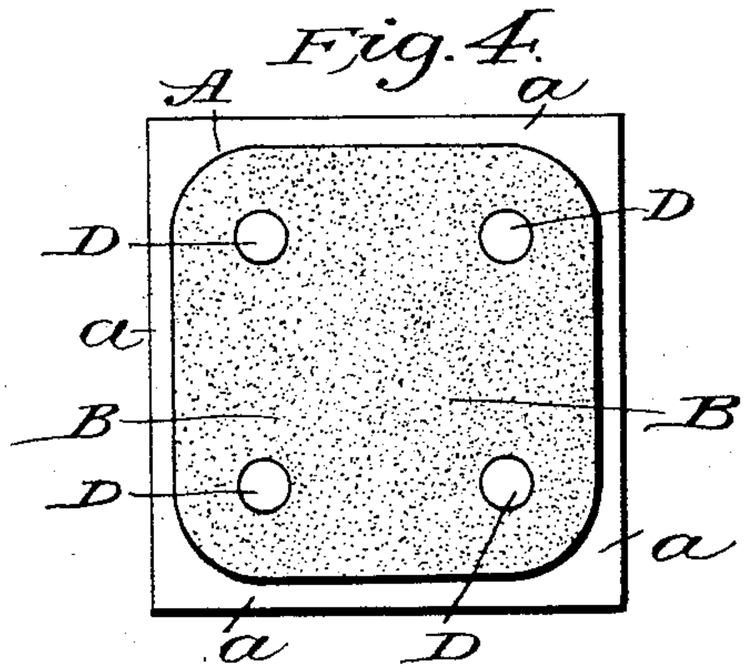


Fig. 4.



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UNITED STATES PATENT OFFICE.

TOLMIE J. TRESIDDER, OF SHEFFIELD, ENGLAND.

MANUFACTURE OF ARMOR-PLATES.

SPECIFICATION forming part of Letters Patent No. 529,050, dated November 13, 1894.

Application filed March 27, 1893. Serial No. 467,785. (No model.) Patented in England January 23, 1893, No. 1,470; in France March 14, 1893, No. 229,056; in Belgium March 15, 1893, No. 103,850; in Germany March 15, 1893, No. 71,980, and in Italy March 31, 1893, LXVI, 103.

To all whom it may concern:

Be it known that I, TOLMIE JOHN TRESIDDER, captain, late of Her Majesty's Royal Engineers, a subject of the Queen of Great Britain and Ireland, residing at Atlas Steel and Iron Works, Sheffield, in the county of York, England, have invented certain Improvements in the Manufacture of Armor-Plates, (for which I have obtained Letters Patent in Great Britain, No. 1,470, dated January 23, 1893; in France, No. 229,056, dated March 14, 1893; in Belgium, No. 103,850, dated March 15, 1893; in Germany, No. 71,980, dated March 15, 1893, and in Italy, LXVI, 103, dated March 31, 1893,) of which the following is a specification, reference being had to the accompanying drawings, in which—

Figure 1 is a cross section of a plate and material employed in carrying out my invention. Fig. 2 is a plan of the same with part of the material omitted. Figs. 3 and 4 are similar views in which a further step of the process is illustrated.

Hitherto in the process of cementation, or conversion, to supercarburize one side of an iron or a low grade steel plate to constitute an armor plate the carburizing material has always been in contact at least with the whole surface of the side to be supercarburized and more generally the said carburizing material has in addition been carried more or less down the edges at the parts contiguous to that side. In the first case the supercarburization is carried quite to the edges of the plate and in the second case the supercarburization is not only carried to the edges but is there considerably intensified. In the first case when the plate is chilled its hardness at the corners will exceed that at the edges and that at the edges will exceed that at the surface generally for the reason that while the supercarburization is uniform the corners can part with their heat to the chilling medium in three directions and the edges in two directions but the surface can part with its heat only in one direction while in the second case this applies not only to the chilling but also to the supercarburization which precedes it, as the carbon enters the corners from three directions the edges from two directions, but the surface from one direction only. Hence armor plates, hitherto manufactured on any method involving supercarburization on one side followed by chilling, have necessarily had their hardest parts at their corners and edges. This is most undesirable for armor plates since it must inevitably tend to facilitate the cracking and breaking thereof under the impact of projectiles and it is a serious drawback from the manufacturers' point of view since the very parts where a greater, or lesser final trimming, and correction of shape are likely to be required are the most unmachineable.

With a view to removing these objections my invention consists in an armor plate of homogeneous metal in which the main portion of the front of the same is hardened, while its edges and a margin extending from the front corners of said edges is left softer. This I do by so applying the carburizing material (whatever it may be) that its contact with the surface of the plate ceases some distance from the edges and corners, as illustrated in cross section in Fig. 1 and in the plan of a plate in Fig. 2, the non-carbonaceous matter C being omitted from Fig. 2 for the sake of clearness. This distance is so arranged that the surface of the plate shall be supercarburized to the required extent only. For instance, in cases where the plate has been cut to its finished dimensions before supercarburization, the carbonaceous matter may be in contact with the surface of the plate up to about say within one half of an inch from the edges so as to lose the bulk of its effect at about one eighth of an inch from the edges and so allow a little final trimming of those edges with steel tools, or the carbonaceous matter may be in contact with the surface of the plate up to say one, two, or three inches or more from its edges so as to leave a margin or frame of tough, or unhardened, metal of any desired width round the whole or part of the plate or, if the plate is to be cut to its finished dimensions after the supercarburizing process, it may be supercarburized to within say one eighth of an inch from the edge plus the width of the portion to be cut off, or plus that width together with any

desired width of tough unhardened margin or frame. The width at the corners of the un-supercarburized portion should, in either case, be rather more than its width at the sides, as shown clearly by the plan Fig. 2.

The extreme edges at *a* and the corners therefore, not being supercarburized, are not susceptible of hardening by the subsequent chilling and can be machined as freely after the plate has been chilled as before, although the general surface of the plate is of the requisite hardness. If a margin, or frame, of tough, or unhardened, metal be left round the finished plate, (or say in a "belt" plate along the top and bottom edges,) the liability of the plate to cracking, or breaking, under the impact of projectiles, will be lessened. Further, to overcome the objection very hard faced armor plates are naturally open to, namely, that they cannot be operated upon, for instance, by drilling for the attachment of fittings, such as torpedo booms for a ship, or ring bolts for a fort, I insert where required in the carburizing medium (of whatever kind) a piece, or patch, or pieces, or patches, of non-carburizing material of such size and form and in such positions as to cover the part, or parts, of the plate which it is desired to drill, or to otherwise operate upon, so that the said part, or parts, will not be supercarburized and so will remain in a condition to be operated upon by steel tools, for instance, after the plate has been chilled.

In Figs. 3 and 4 I have repeated Figs. 1 and 2 respectively with the additions necessary to illustrate this modification, D being the pieces or patches of the said non-carbonaceous matter to protect the parts beneath them from supercarburization, so that when the plate undergoes the final chilling process these parts will contain too little carbon to allow of their becoming appreciably hardened.

The plate is, of course, in all cases protected from the fire by non-carbonaceous material at places not covered by the carbonaceous matter as shown, for instance, at C in Figs. 1 and 3.

I am aware that it has been proposed to cut grooves or recesses in plates to be hardened, which recesses or grooves are filled with non-carbonaceous material during the hardening process, whereby the walls and bottoms of said grooves or recesses are left soft, but plates provided with such grooves or recesses are not so strong as those having a plain face, inasmuch as they are weakened by the removal of the metal from said grooves or recesses. In my invention on the contrary the plate is not weakened in the least, as it is left with its original smooth and unbroken surface.

I am also aware that it has been proposed to make a die having a plain back and face and inclined sides, and to treat the same in such a manner that the face and a portion of its inclined sides shall be hard, while its back and the rear edges of said inclined sides adjoining the back will be hard as shown in the United States Patent No. 86,467, and make no claim to this, for if an armor plate were made in this way, it would still leave the front edges or corners very hard and brittle, in fact, harder and more brittle than the rest, for the reason that such edges or corners would have absorbed carbon from both sides of the corners or edges, leaving plates made in this manner open to the same objection as that heretofore described as inherent in the method illustrated by Fig. 2 of the drawings. In my plate, on the contrary, the front corner edges and a portion of the front side immediately contiguous to the edges are comparatively soft, and thus are not liable to chip off, but on the contrary would serve to prevent cracks in the hardened part extending to the extreme edges, and moreover, the softer metal forms a kind of frame in which the harder metal is contained, and would be held even if the face of the plate were badly broken. From this it will be seen that my plates are much superior to the ordinary plates, or even plates made by the method described in making dies in said United States Patent No. 86,467, and that they are much more convenient to the manufacturer or ship builder.

I am further aware that it is not new to make a plate with a steel face and borders of iron, such being shown in the Ellis Patent No. 232,476, but my plate is homogeneous, and is not liable to scale off as such compound plates have been found to do.

What I claim as new is—

1. As an improved article of manufacture, an armor plate made of homogeneous metal in which the main portion of the front side of the plate is hardened and its edges and a margin extending from the front corners of said edges around on the face is left softer, substantially as described.

2. As an improved article of manufacture, an armor plate made of homogeneous metal having an unbroken surface and the main part of its face hardened, the margin of said face, the edges and back of the plate, and spots on the face in a softer state, substantially as hereinbefore set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

T. J. TRESIDDER.

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