May 2, 1944. C. J. HARDY, JR 2,348,130

ARMOR PLATING

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Fig. 1.

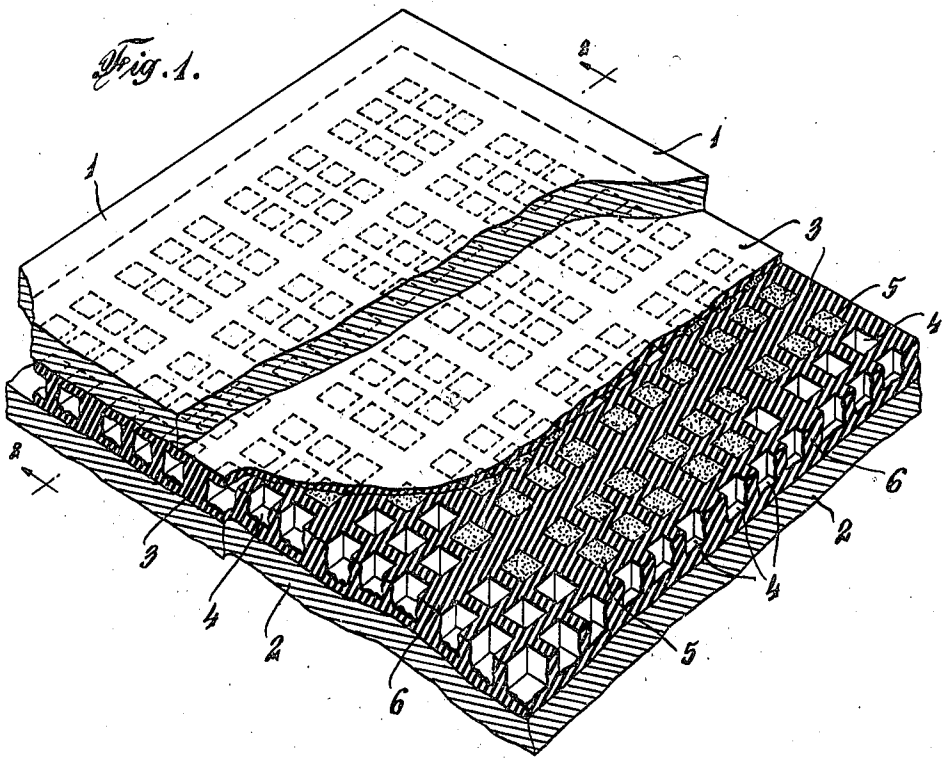
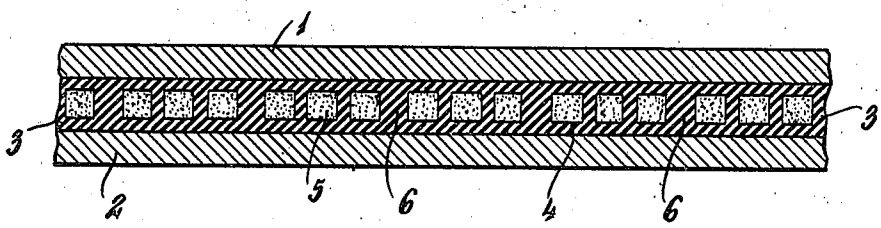


Fig. 2.



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ARMOR PLATING

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3 Claims. (Cl. 109—84)

My invention relates particularly to what is called laminated armor plating, that is, such plating as is built up of a plurality of layers, instead of consisting of a single layer; and objects of my invention are to increase the resistance of the laminated plating to a projectile; to decrease the penetrative power of a projectile striking the plating; to deflect the course of a projectile through the plating so as to diminish its penetrative effect; to scour or remove from the projectile grease or other similar substance calculated to assist its passage through metal; to diminish the size of the aperture in the back of the plate caused by a projectile passing through it; and to obtain the other desirable results hereinafter set forth.

As is well known by those familiar with the art, when a soft jacketed steel cored projectile strikes a sheet of steel or similar armor plate substantially at right angles it will punch or drive out of the plate a disk or slug of metal substantially larger than the hard core of the projectile and will probably drive such disk or slug before it through the plating thus causing a hole which is substantially larger than the projectile itself. This result is probably due to the slug or button of hard metal lying in a plane at right angles to the longitudinal axis of the projectile and being driven flatwise against the metal plating ahead of it. If there are a number of steel plates laminated together successive disks or slugs increasing in diameter with each plate are apt to be driven out of them so that the hole made by the projectile is considerably larger.

If, however, the slug can be tipped to one side or the other from its initial plane the projectile will tend to wedge past it and to bend to one side where the resistance of the slug may be least. This results in swerving the projectile from a direct course so that its line of force in the plating will be more or less oblique and will meet with greater resistance from the plating because of that fact. To accomplish this, I introduce between sheets of steel or other suitable hard metal armor a sheet of yieldable material, such, for instance, as rubber, and embed in pockets within the sheet localized quantities of hard, preferably granulated, material, such for instance, as dry sand, iron filings, emery and similar abrasives, held in local masses within the body of the rubber sheet, the rubber of which is sufficiently stiff to retain its shape substantially while being inclosed between the hard metal plates after which it may be vulcanized by heat so as to cause it to adhere to the metal plates, holding them together. These pockets of abrasive material may be of any desired form but they are preferably disposed so that neither of them will completely cross the path of a projectile piercing the armor plating. Consequently, when a projectile strikes the plate and drives before it the disk or slug referred to above, the slug will not encounter uniform resistance before it because the portion of it which may impinge upon the pocket of abrasive material will be retarded, while the part which encounters only the rubber will go forward more readily, thus causing the disk to tip so that the nose of the projectile will tend to slip past it to one side, thus wedging in between the disk and the hard plating and offering increased resistance to the projectile, which will also be thrown off its direct line of force and directed more or less to one side, thereby further diminishing its effective force.

Furthermore, the effect of the abrasive on the hard core of the projectile will be to rub and scour off the grease or other lubricant which is usually placed around the projectile before it receives its soft metal coating. This still further impedes the projectile and diminishes its penetrative power, so that it results that the penetrative damage inflicted by the projectile will be materially diminished.

In the drawing, in all of which similar parts are designated by similar reference numerals, I have illustrated a piece of laminated armor plating made in accordance with my invention, Fig. 1 being a perspective view of a portion of such a composite plate, partly in section to better illustrate its construction, and Fig. 2 is a cross sectional view, taken as on the line 2—2 of Fig. 1. Steel or other hard metal plates 1, 2 form the two sides of the laminated plate; and between them is inclosed a layer of rubber 3, in which is formed a plurality of pockets 4, 4 lying within the mass of the rubber. These pockets do not open through the sides of the rubber sheet, which presents uniform, unbroken faces against the adjacent steel plates. These pockets 4, 4 are filled with an abrasive material 5, such as sand, with the result that the abrasive lies in isolated bodies within the rubber sheet and is not brought into direct contact with the steel armor plating. These pockets 4, 4 are shown in the drawing as being rectangular; but it should be understood that they may be cylindrical or of other unitary form. It is preferable that they be disposed more or less regularly throughout the rubber sheet, although groups of them may be separated from adjacent pockets by webs 6, 6 of increased

width to afford greater support to the rubber plate in uniting the steel plates. When the rubber sheet has been placed between the steel armor plating it may be vulcanized by applied heat so as to cause it to adhere to the steel plates holding them in properly assembled relation.

It should be understood that additional rubber sheets similar to the one above described may be inserted between successive layers of steel plates to increase the thickness and resistance of the laminated plating; for, as already pointed out, the upsetting of the slugs punched from the hard metal plates and the scouring and resisting action of the abrasive will continue to occur as the hard core of the projectile encounters successive layers of hard metal.

I wish it to be understood that the embodiment of my invention that I have described is to be considered as typical and not as exclusive, for details may be varied, as by the use of equivalents, without departing from the spirit of my invention or the scope of my claims.

Having thus described my invention what I claim and desire to secure by Letters Patent of the United States is:

1. A projectile-resistant structure comprising at least two layers of armor plate between which is interposed a layer of relatively yieldable material in which are located isolated masses of material having abrasive qualities adapted to upset a disk or slug driven out of one plate before such disk or slug reaches the second plate.

2. A structure as specified in claim 1 in which the yieldable material is vulcanized rubber.

3. A structure as specified in claim 1 in which the abrasive material is sand.

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