R. S. EDMONDSON.

PLATE FOR RESISTING FLAME AND CUTTING TOOLS.

APPLICATION FILED AUG. 18, 1921.

1,423,652. Patented July 25, 1922

2 SHEETS—SHEET 1.

Fig: 1

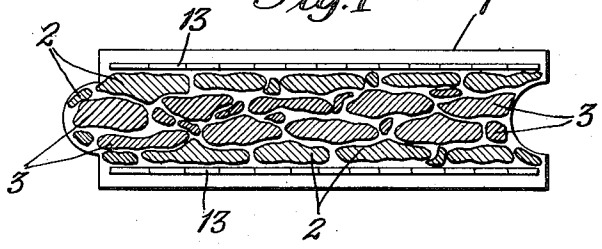


Fig: 2.

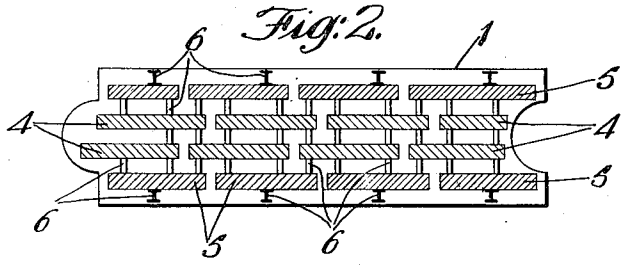


Fig: 3.

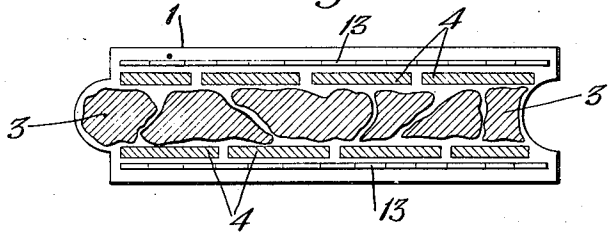


Fig: 4.

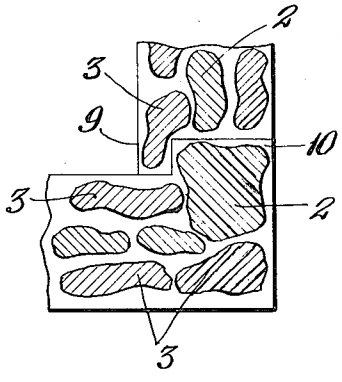


Fig: 5.

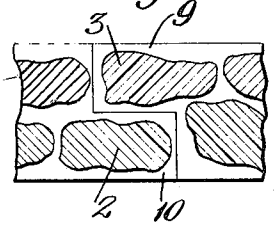
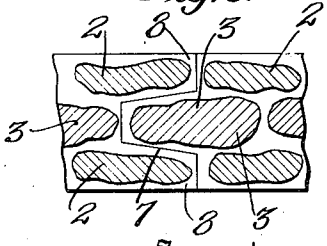


Fig: 6.



Inventor

Ralph S. Edmondson

By his Attorney

A. Parker Smith

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2 SHEETS—SHEET 2.

Fig: 7.

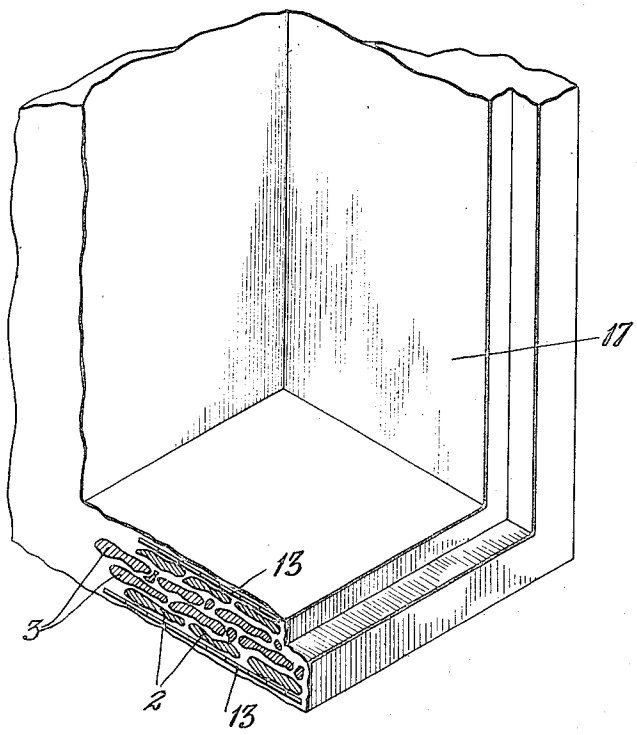
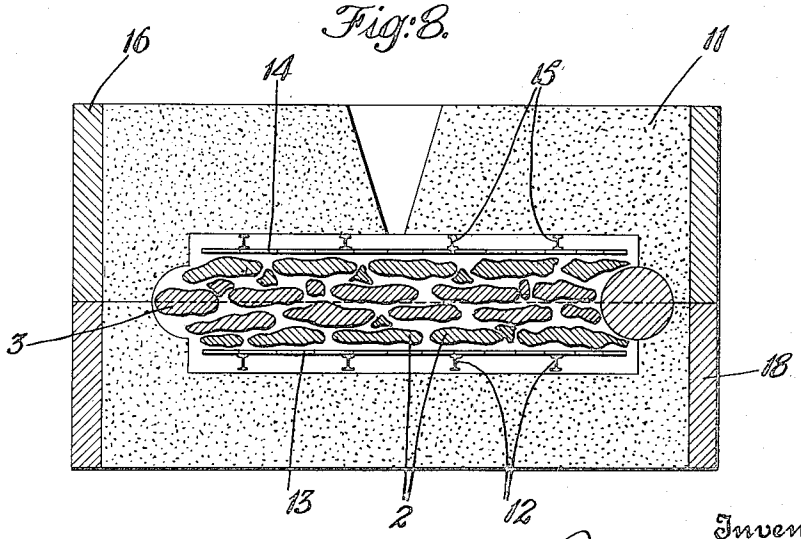


Fig: 8.



Inventor

Ralph S. Edmondson

By his Attorney

A. Parker Smith

UNITED STATES PATENT OFFICE.

RALPH S. EDMONDSON, OF ELIZABETH, NEW JERSEY, ASSIGNOR TO AMERICAN ABRASIVE METALS COMPANY, A CORPORATION OF NEW YORK.

PLATE FOR RESISTING FLAME AND CUTTING TOOLS.

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To all whom it may concern:

Be it known that I, RALPH S. EDMONDSON, a citizen of the United States of America, residing at Elizabeth, county of Union, State of New Jersey, with a post-office address at 50 Church Street, New York, N. Y., have invented certain new and useful Improvements in Plates for Resisting Flame and Cutting Tools, of which the following is a specification.

My invention relates primarily to the production of a lining for the walls of bank vaults, safes, etc., which shall be highly resistant to perforation by the action of cutting tools such as drills, or of the flame of an oxy-acetylene torch. The invention is, however, applicable to other uses.

The problem of rendering bank vaults and safes practically burglar proof comes down to a question of producing a wall, or lining for a wall structure, which shall resist perforation by either an electric drill or other cutting tool, or the flame of an oxy-acetylene torch long enough to prevent the burglar gaining access to the interior before the guard makes his next inspection, or daylight and the working force of the institution return.

The general principle underlying the most advantageous embodiment of my invention is the formation of a plate or slab by embedding in a suitable cast metal matrix, such as cast iron, integral masses of highly refractory materials so disposed that it is impossible, or at least difficult for any hole to be made in a straight line through the plate or slab without encountering one of these embedded refractory masses. It is practically impossible to make the entire plate of any very refractory material because such materials are extremely difficult to work and also usually have much less toughness and strength than cast iron.

Another difficulty in the complete solution of the problem arises from the fact that materials having the highest fusion points, and consequently presenting the greatest resistance to the disintegrating action of a flame, are usually comparatively friable and therefore easily pierced by a drill, while those materials which present the greatest resistance to cutting or attrition do not have the highest melting points. My invention overcomes this latter difficulty by embedding in one matrix a plurality of superposed layers of material, one of which possesses great heat resisting qualities and another of which possesses great powers of resistance to cutting tools.

The best embodiments of my invention at present known to me are illustrated in the accompanying two sheets of drawings in which

Fig. 1 is a cross section through a plate embodying one form of my invention, the matrix or body of the plate not being cross hatched for greater clearness.

Figs. 2 and 3 are similar views showing slight modifications.

Figs. 4, 5 and 6 are detail cross sections showing different forms of joints between the plates.

Fig. 7 is a perspective view of a corner piece for a safe or vault made in accordance with my invention, parts being broken away, and

Fig. 8 is a vertical cross section through a mold showing the preferred method of making plates embodying my invention.

Throughout the drawings like reference characters indicate like parts.

1 indicates the cast-iron matrix in which are embedded integral masses of the highly resistant materials. As I am at present advised, fused magnesia is the material best available for heat resisting purposes, as it does not fuse until a temperature of about 2800 degrees centigrade is reached, and does not begin to soften appreciably until subjected to a temperature of about 2000 degrees centigrade. This material is usually fused in crucibles in an electric furnace and then cooled and broken up into lumps or irregular masses. The best materials for affording resistance to cutting tools at present known to me are various forms of fused aluminum oxide. The ordinary form of aluminum oxide which is a product of the electric furnace, will serve. This has been heretofore given various trade names such as alundum, aloxite, etc. This material in another form known as A. A. aloxite, is still more resistant to cutting or boring operations; and spinel, a mixture of aluminum oxide and fused magnesia, is best of all for this purpose, so far as my present information goes, as it serves both purposes.

In Fig. 1, layers of irregular masses of the fused magnesia 2, 2, are shown adjacent either surface of the matrix body 1. The masses should preferably be so arranged in the respective layers that any perforation of the matrix body 1 passing between any two particles would almost certainly strike another solid body of the material in the same, or another, layer if continued in a straight line. A layer of the aluminum oxide particles is shown at 3, between the layers 2, 2. The integral masses in layer 3 are preferably of assorted sizes known as "graded aggregate" and are numerous enough, and are so packed together, that no tool passing between any two masses could continue to bore through the plate without probably striking a third solid mass of the aluminum oxide. This can be most certainly attained by packing together lumps of these graded sizes so that the smaller masses fit into the voids or spaces left between the larger ones.

Fig. 2 shows a plate having several layers of slabs of the refractory materials arranged in the matrix 1. The slabs are usually formed of masses adhering to the sides or bottoms of the crucibles, so that they are of more regular shape than are the irregular masses produced by breaking up the interior portion of the fused materials. For convenience of illustration, however, these masses are indicated conventionally by rectangles, in Fig. 2. The two inner layers 4, 4 are preferably of fused magnesia, or equivalent heat resisting materials, while the outer ones 5, 5 are of the fused aluminum oxide or other material resistant to cutting tools. The purpose of placing the heat resisting layers at the interior of the matrix is to get the benefit of the greater difficulty which arises in attempting to melt them when the torch flame has to do its work at the bottom of a fairly deep hole. The members of one layer 4, are preferably arranged to break joints with the members of the other layer 4, and the members of layers 5, 5 are similarly arranged. 6, 6 represent supporting and spacing means by which the slabs of refractory material are held apart in the mold and away from the walls thereof until the iron has been poured around them.

Fig. 3 shows a mingling of the characteristics of Figs. 1 and 2, two exterior layers of slabs 4, 4 of heat resisting material being used with one interior layer 3 of irregular masses of the kind most resistant to cutting tools.

It is important that the wall formed of a series of these plates should have as little weakness as possible at the joints between the plates. This weakness I reduce by forming the edges of the plates with a tongue and groove as shown in Fig. 6, or with mutually overlapping portions as shown in Figs. 4 and 5. In Fig. 6 the tongue is shown at 7 with the layer of drill resisting material 3 extending out into it while the layers of heat resisting material 2, 2, extend out into the walls 8, 8 of the groove in the next plate.

In Figs. 4 and 5 the layers of heat resisting material 2 run out into the tongue 10 of one plate while the layer of drill resisting material 3 runs out into the overlapping tongue 9 of the other plate.

As the corners of the safe or vault built according to my invention would be difficult to guard by overlapping tongues, or by tongue-and-groove constructions, I prefer to cast the corner pieces each in a solid matrix 17, (see Fig. 7) throughout which the several layers of resisting materials 2 and 3 extend as shown at the broken away portions. The outer edges of the three planes forming the corner piece have projections as shown along two of such edges, in Fig. 7, which projections are adapted to intermesh with those on adjacent plates, (as in Fig. 5), or tongue-and-groove formations such as are shown in Fig. 6.

In forming the above described plates I provide a sand mold 11, such as is indicated in Fig. 8, composed of the drag 18 and cope 16, place supporting means upon the bottom of the space left in the mold, such as iron cross strips 12, 12, and expanded metal or wire netting 13, and form the layers 2 and 3 upon the same. I then place a second piece of expanded metal or wire netting 14 over these, superpose spacing means such as a second set of cross strips 15, over all, place the cope 16 on the top of the mold and pour in the molten iron.

As the fused magnesia, aluminum oxide and similar refractory materials have a lower specific gravity than iron, they would float upward when immersed in the molten iron unless held down by some such restraining means as shown at 14 and 15.

When the iron has cooled it forms a strong matrix holding the refractory materials deeply embedded in its interior so that particles thereof cannot be dug out or otherwise removed.

It will obviously be difficult for a burglar to remove a sufficient portion of a wall built of these plates to admit the body of a man, as wherever the torch flame is applied it will strike one of the magnesia or other heat resisting particles before effecting a perforation, and wherever drilling is attempted the tool will similarly encounter some of the aluminum oxide masses.

Having described my invention I claim:

1. As an article of manufacture a slab or plate for use where combined powers of resistance to heat and cutting tools are required, which slab or plate is composed of

a cast metal matrix in which is embedded a layer of particles of fused magnesia, and a layer of particles of fused aluminum oxide.

2. As an article of manufacture a cast metal body adapted to resist perforation by heat or cutting tools, which body comprises a plurality of substantially parallel layers of integral masses of material having a high fusing point, the masses in one layer being so arranged as to break joints with those in another layer, and a plurality of similarly arranged layers of masses of material presenting a high degree of resistance to cutting tools, all said masses being embedded in a cast metal matrix.

3. A structure such as set forth in claim 2, in which the tool resisting layers are nearest the surfaces of the matrix body and the heat resisting layers are nearer the middle of said matrix body.

4. As an article of manufacture a body adapted to resist perforation by heat or cutting tools, which body comprises a matrix of cast iron in which are embedded a plurality of layers of masses of fused magnesia so arranged that the masses in one layer break joints with those in another, and a plurality of similarly arranged layers of masses of fused aluminum oxide.

5. A structure such as set forth in claim 4, in which the fused aluminum oxide layers are nearer the surfaces of the matrix body than are the fused magnesia layers.

6. A series of plates or slabs adapted when joined together to form a wall presenting uniformly high resistance to perforation by heat or cutting tools, each of which plates or slabs is composed of one or more layers of masses of material possessing the desired resisting qualities embedded in a matrix of cast metal, all the meeting edges of said plates being provided with intermeshing projections and recesses forming overlapping faces extending in the general direction of the common plane of the assembled plates, and some of the above described layers of resisting materials extending throughout each such projecting and overlapping portion of the plates, whereby said plates can be assembled and intermeshed so as to leave no unprotected seam extending through the wall so formed, through which seam a torch flame or cutting tool would be projected without striking an integral mass of the resisting material.

7. A series of plates such as set forth in claim 6 in which each plate has embedded in it a layer of heat resisting material and a layer of tool resisting material, the heat resisting layer extending into the overlapping projection of one plate at each joint, and the tool resisting layer extending into the cooperating projection of the adjoining plate, whereby a torch flame or cutting tool brought to bear upon such joint would necessarily encounter the resistance of both classes of embedded materials.

8. A corner piece for use in building bank vaults and the like structures which comprises an integral matrix of cast metal formed with three planes meeting at right angles, and a layer of masses of highly refractory material embedded in and extending throughout each plane forming such corner piece.

RALPH S. EDMONDSON.