109. SAFES, BANK PROTECTION
AND RELATED DEVICES.

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April 8, 1924.

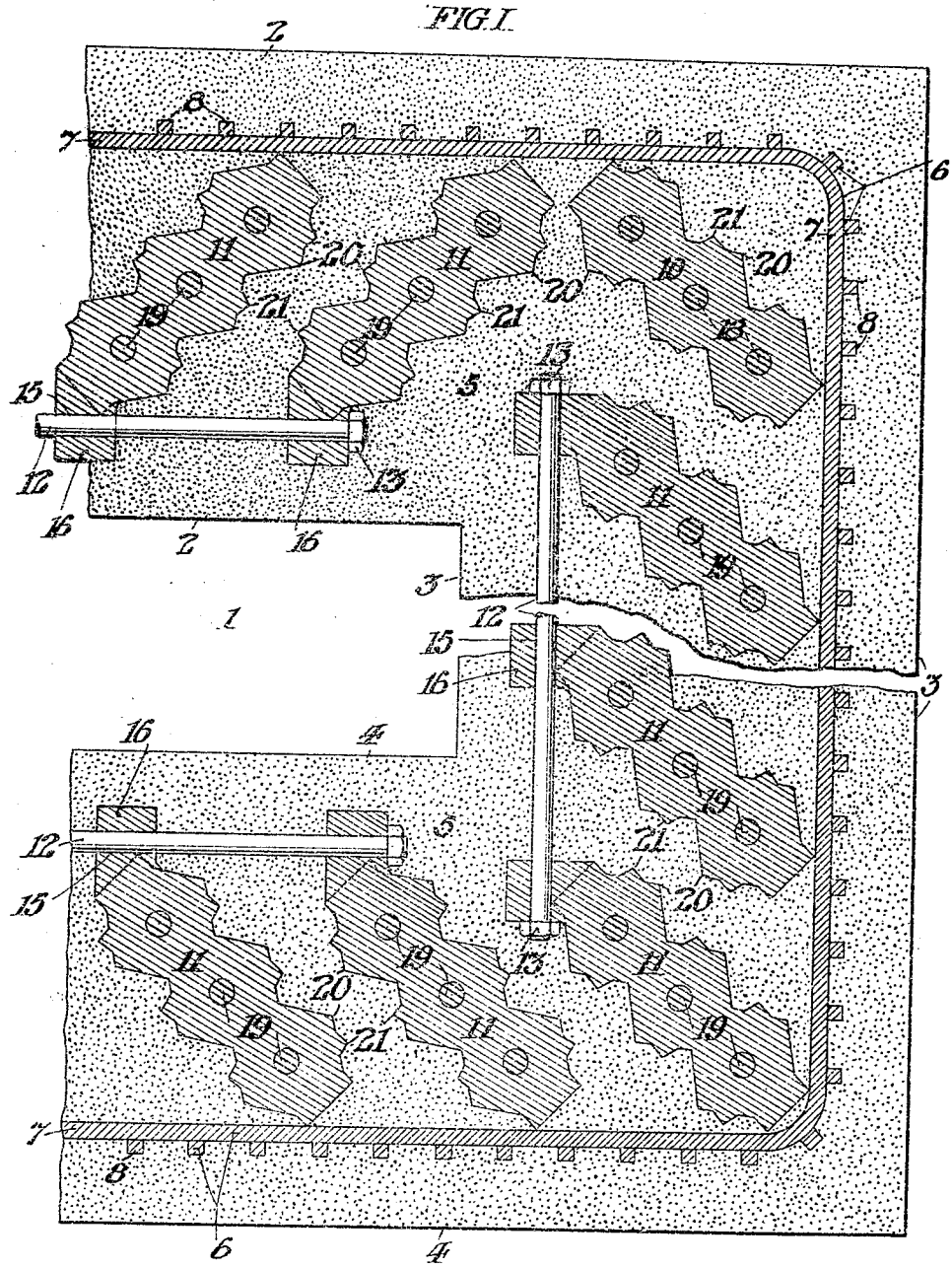
1,489,946

A. KENNEDY

VAULT

Filed March 5, 1921 2 Sheets-Sheet 1

FIG. 1.



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VAULT

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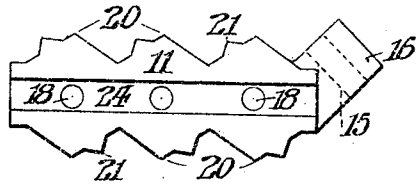


FIG. II.

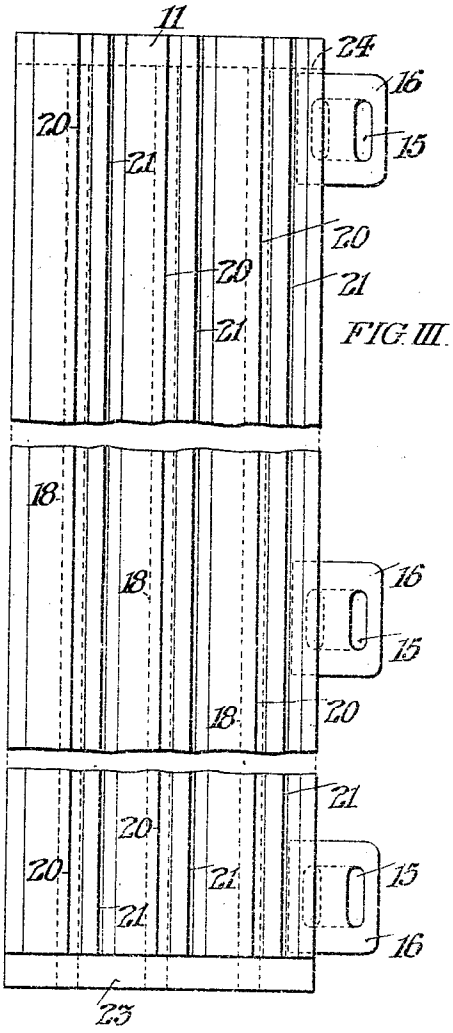


FIG. III.

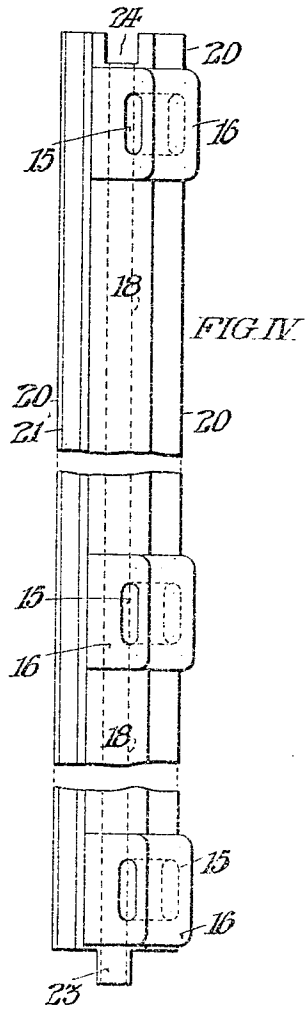


FIG. IV.

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Patented Apr. 8, 1924. 1,489,946

UNITED STATES PATENT OFFICE.

ANTHONY KENNEDY, OF DREXEL HILL, PENNSYLVANIA, ASSIGNOR OF ONE-HALF TO THE HOLLAR COMPANY, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF NEW YORK.

VAULT.

Application filed March 5, 1921. Serial No. 449,759.

To all whom it may concern:

Be it known that I, ANTHONY KENNEDY, a citizen of the United States, residing at Drexel Hill, in the county of Delaware and State of Pennsylvania, have invented a certain new and useful Improvement in Vaults, whereof the following is a specification, reference being had to the accompanying drawings.

My invention is particularly applicable to vaults constructed of reinforced concrete. Although it is usual to make the walls of such a vault approximately thirty inches thick; and to reinforce them with steel bars imbedded in the concrete; it has been found possible to quickly penetrate such walls, by blasting the concrete from between the metallic reinforcing members with explosives inserted in holes drilled in the concrete, and then cutting the reinforcing members by flames from an oxy-acetylene blast burner; such steps being effected in alternation until an opening is made through the vault wall large enough to permit the passage of the body of a man. Therefore, it is an object and effect of this invention to provide such a concrete wall with metallic reinforcing members so constructed and arranged that it is practically impossible to penetrate them by the means above described within "burglars' time."

As hereinafter described, my invention includes the provision of reinforcing members which are cast in the form of massive slabs, having irregularly corrugated surfaces and imbedded in the concrete walls in planes which are oblique to the outer planes of said walls; said slabs being disposed in staggered, overlapped, relation, so that the spaces between them do not afford a continuous passageway at right angles to the outer planes of said walls even if the concrete be entirely removed from between them.

I prefer to maintain such slabs in predetermined assembled relation, both before they are imbedded in concrete and thereafter, by connecting them in groups, conveniently by yoke bars of ductile metal, such as mild steel. Moreover, said slabs are preferably made of alloys which resist oxidation; so that it is impossible to burn them with an oxy-acetylene flame; the only effect of such a flame being to melt the metal, where such a flame is brought into direct contact therewith, and cause it to flow slightly. The typical alloys hereinafter described are of the general nature of cast iron in that they are comparatively brittle. Therefore, I prefer to reinforce such slabs by imbedding in the portions thereof composed of such cast alloys, bars composed of ductile metal, for instance, mild steel; so that it is impossible to blast out such slabs from the walls in which they are imbedded.

My invention includes the various novel features of construction and arrangement hereinafter more definitely specified.

In the drawings; Fig. I is a fragmentary plan sectional view of a portion of a vault embodying a convenient form of my invention.

Fig. II is a plan view of the upper end of one of the yoked reinforcing slabs shown in section in Fig. I.

Fig. III is a side elevation of the slab shown in Fig. II.

Fig. IV is an elevation of the right hand edge of the slab shown in Figs. II and III.

Referring to Fig. I; the vault chamber 1 is inclosed by walls 2, 3 and 4, the principal component of which is a concrete aggregate 5 of hydraulic cement and so-called metal, to wit, fragments of broken stone, sand, etc. However, said wall is reinforced by an outer grill frame 6 conveniently formed of equally spaced horizontal bars 7 and vertical bars 8 in crossed relation. Said bars 7 and 8 may be of any suitable material and form, for instance, they may be mild steel of primarily square cross section, each section one inch in diameter and twisted. However, I have indicated them straight, to simplify the illustration.

I provide within said grill frame 6, imbedded in said concrete aggregate 5, and disposed in planes oblique to the outer faces of said walls 2, 3 and 4; any desired number of massive reinforcing slabs, of the character above contemplated, for instance, such as indicated at 10 and 11. Said slab 10 is independent of the others, but said slabs 11 are yoked in groups by yoke bars 12 which are preferably screw threaded at their ends and provided with nuts 13, as indicated. Said bars 12 extend through slots 15 in lugs 16 on the respective slabs 11. Said slabs 10 and 11 have cast within them reinforcing rods 18 and 19 of ductile metal, for instance, mild steel.

It is to be particularly noted that said slabs 11 and yoke bars 12 are insulated from the inner surfaces of the concrete walls, in which they are imbedded; so that they can not be used as conductors of electricity, to the interior of the vault chamber 1.

Said slabs 10 and 11 are irregularly corrugated upon their opposite faces by providing them with major ridges 20 and minor ridges 21, both of which may extend uniformly throughout the length of the slabs, as indicated in Figs. III and IV.

However, I also prefer to interlock such slabs with both the substructure which supports them and the superstructure which they support, and find it convenient to do so by providing each slab with a tenon ridge 23 at the bottom thereof and a mortise groove 24 at the top thereof. Said tenons 23 are adapted to fit into suitable mortise grooves in said substructure and said mortise grooves 24 are adapted to receive suitable tenons in the superstructure; so that the side walls of the vault are thus interlocked with the bottom and top walls thereof.

It may be observed with reference to Figs. III and IV that the slots 15 in the lugs 16 on the slabs 11 are elongated vertically so as to permit relative movement of the individual slabs sufficient to raise and lower them, individually, to the extent of their tenons 23, without disconnecting the yoke bars 12 by which said slabs 11 are connected in series, as indicated in Fig. I.

I have found that ferric alloys, including large percentages of copper, have the capacity to resist oxidation when subjected to an oxy-acetylene flame, to a desirable degree. However, such alloys are costly and, therefore, I prefer to employ ferric alloys having abnormal percentages of silicon and carbon, for instance, I find that an alloy of the latter type which has proved satisfactory, contains 2.00 per cent of silicon; .75 per cent of manganese; and 3.50 per cent of carbon. However, other alloys capable of resisting oxidation may be employed and, in fact, slabs constructed and arranged as above described and made of ordinary cast iron are sufficiently durable to answer the purpose contemplated.

Although I prefer to both provide said slabs with corrugations and dispose the slabs in oblique relation to the outer surface of the walls which they reinforce; such oblique disposition of the slabs is advantageous whether the slabs are corrugated or not, not only because it prevents the formation of a direct passageway between the slabs at right angles to the outer surface of the wall, but because the inclined faces of the slabs laterally deflect the points of drills which encounter them and thus interfere with drilling the concrete as above contemplated. Of course, the latter effect would not only be attained but would be enhanced, by providing the slabs with smooth outer faces where I have illustrated the corrugations aforesaid.

Therefore, I do not desire to limit myself to the precise details of construction, arrangement or composition of materials herein set forth, as it is obvious that various modifications may be made therein without departing from the essential features of my invention, as defined in the appended claims:

I claim:

1. In a vault structure; a wall including a concrete aggregate; a metal reinforcing grill frame imbedded in said concrete and consisting of bars in crossed relation; and a plurality of massive cast metal slabs imbedded in said concrete, within said frame, and reinforcing the wall; said slabs extending in planes oblique to the outer surface of said wall; said slabs having their surfaces irregularly corrugated by ridges extending longitudinally therein and projecting therefrom to different extents; said slabs having bars of ductile metal cast therein, extending longitudinally in parallel relation with said ridges; said slabs having interlockable elements at their ends adapted to respectively engage substructures and superstructures; said slabs having lugs with slots extending longitudinally therein; and yoke bars extending through said slots, holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

2. In a vault structure; a wall including a concrete aggregate; a plurality of massive cast metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having their surfaces corrugated by ridges extending therein and projecting therefrom; said slabs having bars of ductile metal cast therein; said slabs having interlockable elements at their ends adapted to respectively engage substructures and superstructures; said slabs having lugs with slots extending longitudinally therein; and yoke bars extending through said slots, holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

3. In a vault structure; a wall including a concrete aggregate; a plurality of massive cast metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having their surfaces corrugated by ridges extending therein and projecting therefrom; said slabs having bars of ductile metal cast therein; said

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slabs having lugs with slots extending longitudinally therein; and yoke bars extending through said slots, holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

4. In a vault structure; a wall including a concrete aggregate; a plurality of massive cast metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having their surfaces corrugated by ridges extending therein and projecting therefrom; said slabs having interlockable elements at their ends adapted to respectively engage substructures and superstructures; said slabs having lugs with slots extending longitudinally therein; and yoke bars extending through said slots, holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

5. In a vault structure; a wall including a contrete aggregate; a plurality of massive cast metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having their surfaces corrugated by ridges extending therein and projecting therefrom; said slabs having lugs with slots extending longitudinally therein; and yoke bars extending through said slots, holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

6. In a vault structure; a wall including a concrete aggregate; a plurality of massive cast metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having bars of ductile metal cast therein; and yoke bars holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

7. In a vault structure; a wall including a concrete aggregate; a plurality of massive cast metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; and yoke bars holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

8. In a vault structure; a wall including a concrete aggregate; a plurality of massive metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having bars of ductile metal cast therein; said slabs having interlockable elements at their ends adapted to respectively engage substructures and superstructures; and means holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

9. In a vault structure; a wall including a concrete aggregate; a plurality of massive metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having bars of ductile metal cast therein; and means holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

10. In a vault structure; a wall including a concrete aggregate; a plurality of massive metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; said slabs having interlockable elements at their ends adapted to respectively engage substructures and superstructures; and means holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

11. In a vault structure; a wall including a concrete aggregate; a plurality of massive metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surface of said wall; and means holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

12. In a vault structure; a wall including a concrete aggregate; a plurality of massive metal slabs imbedded in said concrete and reinforcing the same; and means holding said slabs in assembled relation; said slabs being composed of metal capable of resisting oxidation by an oxy-acetylene flame.

13. In a vault structure; a wall including a concrete aggregate; a cast metal slab imbedded in said concrete and reinforcing the same; said slab extending in a plane oblique to the outer surface of said wall; and a ductile metal element imbedded in the cast metal of said slab and arranged to prevent the latter from shattering, when subjected to the action of an explosive; said cast metal being an alloy capable of resisting an oxidizing flame.

14. In a vault structure; a wall including a concrete aggregate; a cast metal slab imbedded in said concrete and reinforcing the same; and a ductile metal element imbedded in the cast metal of said slab and arranged to prevent the latter from shattering, when subjected to the action of an explosive; said cast metal being an alloy capable of resisting an oxidizing flame.

15. A vault wall reinforcement, comprising a unitary slab of brittle cast ferric alloy

capable of resisting an oxidizing flame, having a bar of ductile metal imbedded therein, arranged to prevent it from disintegrating when broken; said slab being corrugated upon its outer face and having an opening for yoke means, whereby a series of such slabs may be connected.

16. In a vault structure; a wall including a concrete aggregate; a plurality of massive cast metal slabs imbedded in said concrete and reinforcing the same; said slabs extending in planes oblique to the outer surfaces of said wall; and yoke bars holding said slabs in assembled relation; said yoke bars extending in planes parallel to the outer surface of said wall and imbedded in said concrete; whereby said yoke bars are insulated from the inner surface of said wall.

In testimony whereof, I have hereunto signed my name at Philadelphia, Pennsylvania, this third day of March, 1921.

ANTHONY KENNEDY.

Witnesses:
ARTHUR E. PAIGE,
CAROLYN E. REUTER.