

Dec. 11, 1956

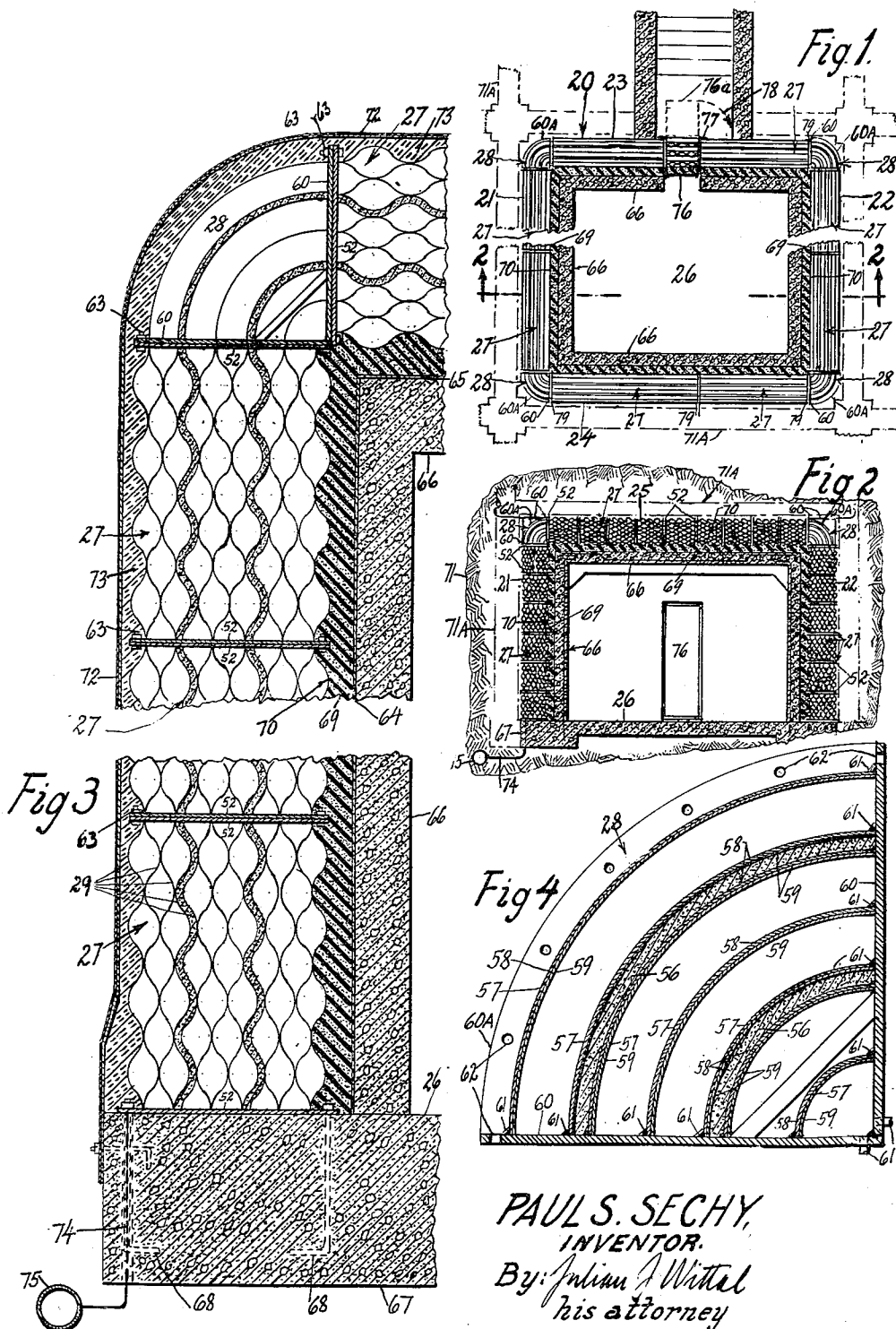
P. S. SECHY

2,773,459

PROTECTIVE WALL FOR USE AGAINST RADIATION AND EXPLOSIVE FORCES

Filed Sept. 23, 1950

3 Sheets-Sheet 1



Dec. 11, 1956

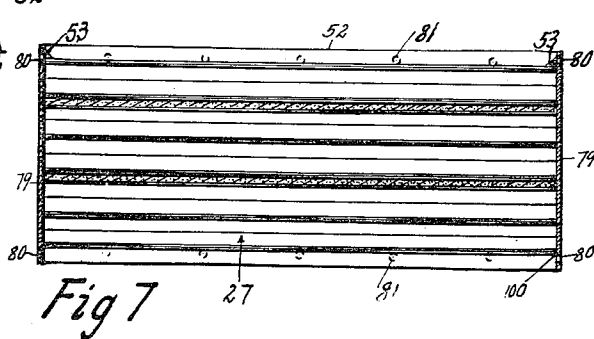
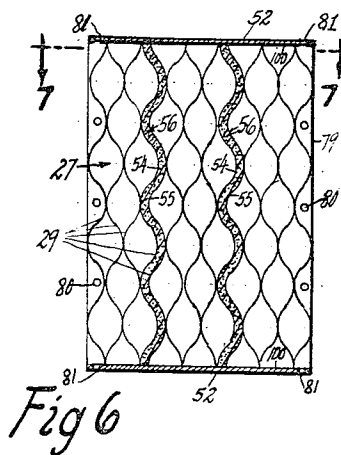
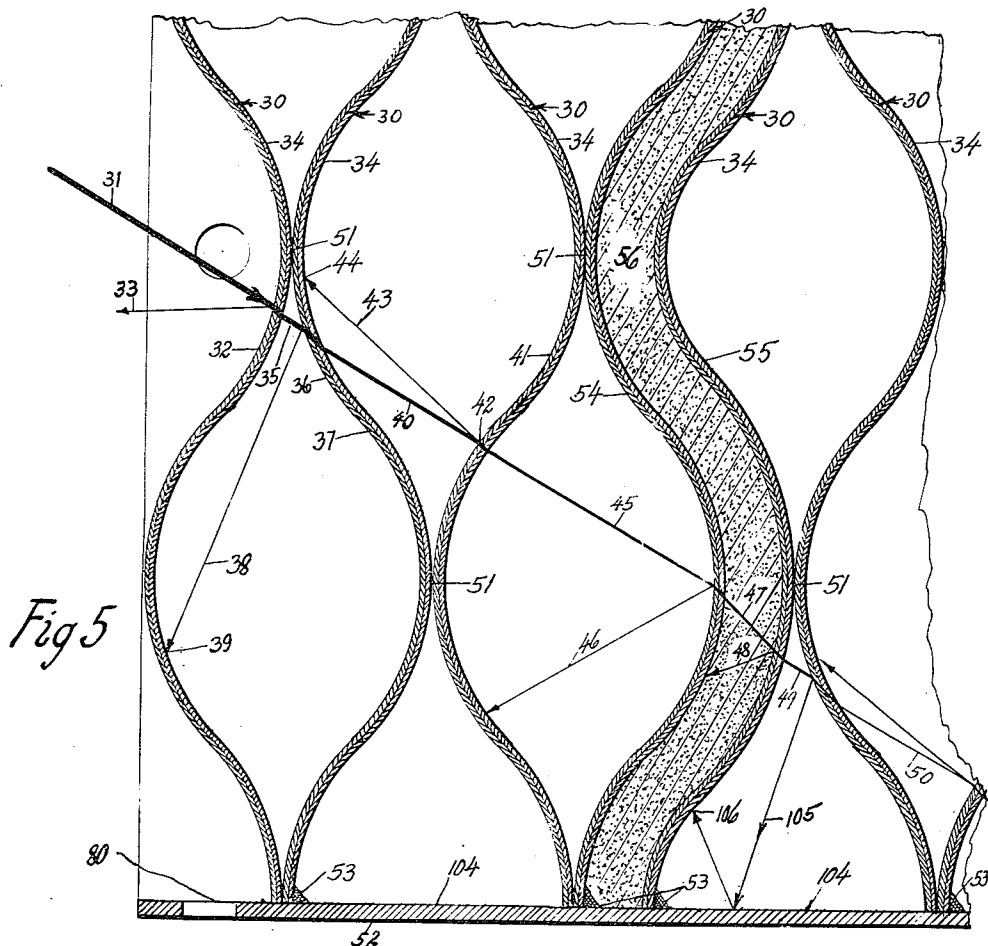
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2,773,459

PROTECTIVE WALL FOR USE AGAINST RADIATION AND EXPLOSIVE FORCES

Filed Sept. 23, 1950

3 Sheets-Sheet 2



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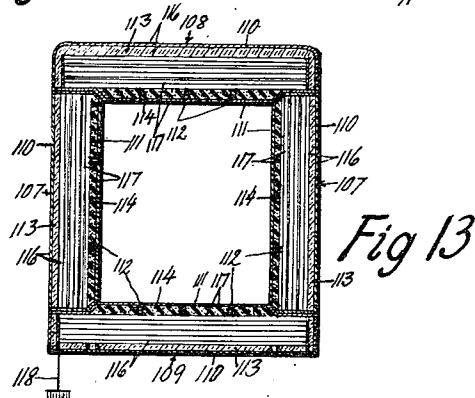
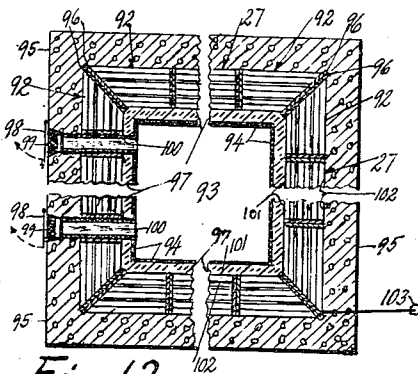
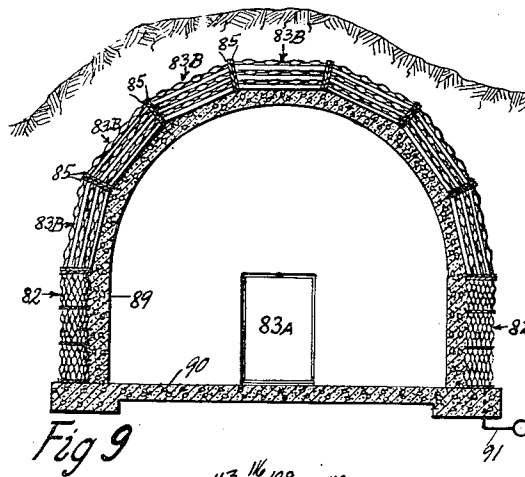
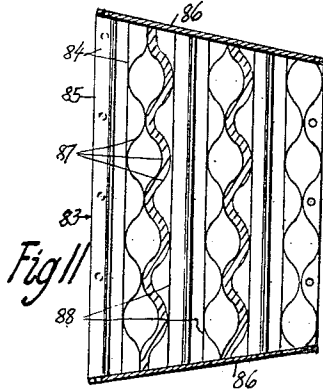
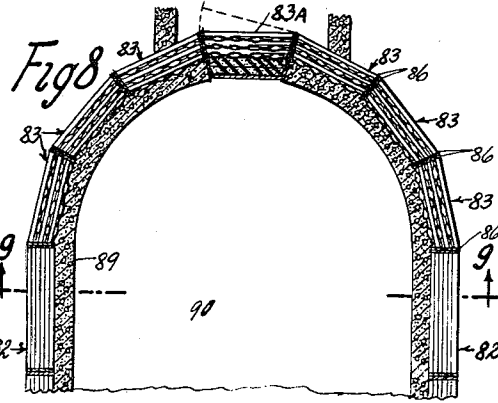
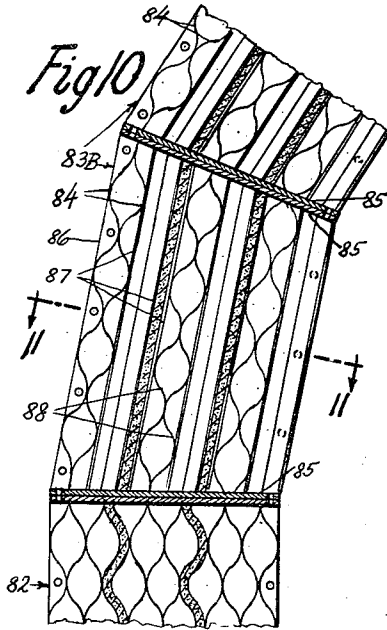
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2,773,459

PROTECTIVE WALL FOR USE AGAINST RADIATION AND EXPLOSIVE FORCES

Filed Sept. 23, 1950

3 Sheets-Sheet 3



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2,773,459

PROTECTIVE WALL FOR USE AGAINST RADIATION AND EXPLOSIVE FORCES

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Application September 23, 1950, Serial No. 186,332

2 Claims. (Cl. 109—82)

This invention relates to protecting devices against the effects of radioactive bombs, radioactive materials, and the like, and has for its main object to provide an improved construction of this type which will have combined protection against explosive forces, against heat and high temperatures, and against all kinds of harmful rays, like gamma rays, X-rays, neutrons, and the like.

Another object of this invention is to provide a device which will have novel reliable protection against an explosive force, like that of a bomb striking the same from one side, but will be light in construction, and will have automatic reinforcing and resilient resisting action against such force.

Still a further object of this invention is to provide a novel protecting device against; injurious harmful rays, like gamma rays, X-rays, and the like, whereby outwardly turned mirror polished surfaces will be employed to diffuse or scatter such rays and reflect high temperature heat waves and also chemical compounds will be employed inwardly adapted to absorb the reflected rays.

Another object of this invention is to provide a fire-proof heat retarding material between sheets having outwardly turned mirror-like surfaces to diffuse or scatter and throw back said rays and a coating of chemical compounds employed inwardly of them adapted to absorb the reflected rays.

A further object of this invention is to provide a device as characterized hereinbefore, which will be arranged for inverted action, that is, to protect an atomic pile or similar object adapted to send from inside out harmful rays and other forces, said device being adapted to prevent the exit of such rays and forces.

Still further objects of this invention will be apparent as the specification of the same proceeds or will be pointed out therein, and, among others, I may mention: to provide a device of the many advantages and new uses and objects indicated hereinbefore which still will be simple in construction, inexpensive to manufacture and build, adapted to build shelters through its use whether underground or above it, and which also will be specifically adapted to provide protection for vehicles like motor cars, railroad cars, ships, airplanes, and generally provide protecting devices for use against harmful rays where needed.

In the drawings forming a part of this specification and accompanying the same:

Fig. 1 is a diagrammatic horizontal sectional view of a shelter built underground or built into the basement of an existing building or around a new basement of a new building against atom bombs and the like and built according to my invention, and

Fig. 2 is a vertical section thereof, the section being taken on the line 2—2 of Fig. 1;

Fig. 3 is a fragmentary detail of the sectional view of Fig. 2 on a much larger scale with outside casing and heat insulation added in case the shelter is exposed;

Fig. 4 is a corner construction of my device on a larger scale than it is indicated in Figs. 1, 2 and 3;

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Fig. 5 is a sectional detail of my novel protective wall construction indicated in the sections of Figs. 2 and 3, said detail being shown at a greatly enlarged scale and showing its parts and their operation;

Fig. 6 is a sectional view of a unit used in such wall construction, while

Fig. 7 is a plan view thereof, the top frame plate of the same having been removed;

Fig. 8 is a diagrammatic fragmentary horizontal section of a portion of a larger shelter or building with curved walls built according to my invention, and

Fig. 9 is a vertical sectional view thereof;

Fig. 10 is an enlarged detail sectional view of a construction shown in Fig. 9, and

Fig. 11 is a transverse sectional view of a unit in said construction, the section being taken on the line 11—11 of Fig. 10;

Fig. 12 is a diagrammatic fragmentary horizontal sectional view of an atomic pile device to protect workers by a construction of my invention;

Fig. 13 is a diagrammatic vertical section of a vehicle to which my invention has been applied.

Referring now to the drawings, more in detail, by characters of reference, the numeral 20 indicates a subterranean shelter built according to my invention, in general, having the side walls 21 and 22, the front wall 23, rear wall 24, top 25, and bottom 26. The walls and top of my shelter are preferably built of units, generally indicated by the numeral 27, while the corners of the device are built with specific curved units generally indicated by the numeral 28.

In Figs. 3 and 6 the construction of these units is indicated in a diagrammatic manner and it will be seen that each unit is composed of a plurality of corrugated sheets or plates 29 of stress resisting but substantially resilient and bendable material, as steel, appropriate aluminum alloy, and the like.

In Fig. 5 the construction of these units and the nature of the corrugated sheets forming elements thereof is shown in more detail, and according to my invention the outer surfaces thereof, turned towards the outside against which direction a protection is needed, will be mirror finished. It will be obvious that such mirror finished sheets will scatter or diffuse the rays thrown on them, as for instance, gamma rays, particularly when the plates or sheets are curved and the rays will strike the curved surfaces at an angle and will be scattered therefrom at an angle corresponding thereto. Also such surfaces will reflect high temperature heat waves.

In Fig. 5, arrow 31 indicates the direction in which certain rays, as for instance gamma rays, will strike the mirrored outer surface of a first corrugated sheet 32, and a part of said rays will be reflected, as indicated by the arrow 33.

The rear surface of each corrugated sheet, generally indicated by the numeral 30, in my device will be coated by a material adapted to absorb such rays, as for instance cadmium plating, lead or other appropriate materials, such coating being generally indicated at 34.

To provide another powerful absorbent against such rays, I also may employ pairs of such corrugated sheets at certain places in my wall construction in parallelism with one another as indicated at 54 and 55, and I fill or pack the space between them with a gamma ray and neutron absorbing material, as for instance, tungsten phosphate, cadmium boro-silicate with fluorides, or graphite bricks, or beryllium or silicon—such packing being generally indicated by the numeral 56.

Now, only a portion of the rays like gamma rays will pass through the first corrugated sheet 32 as a certain portion thereof has been scattered, as indicated by the arrow 33. The reduced portion of the gamma rays so

passing is indicated by the arrow 35, and it will strike the mirrored outer surface 36 of the second corrugated sheet 37, and a portion thereof, again, will be scattered therefrom, as indicated by the arrow 38. This portion will strike the coated rear surface of the corrugated sheet 32 in front thereof as indicated at 39 and will be absorbed by such coating. This procedure will be continued through a plurality of corrugated sheets in my construction, each having a mirrored surface turned outwardly and a surface coated as described turned inwardly of the shelter. So for instance, the arrow 40 indicates the portion of the rays which pass through the second corrugated sheet 37 and which will strike the mirrored outer surface of the third corrugated sheet 41 as at 42, and a portion of which will be reflected therefrom, as indicated by the arrow 43, striking the coated rear surface of the second sheet at 44, and being absorbed by said coating. The continued such partial scatterings and partial absorptions by the coatings of the gamma rays are indicated by the further respective arrows 45, 46, 47, 48, 49 and 50 in Fig. 5, and, of course, every succeeding sheet will have less and less rays to scatter or to absorb the decreasing strength of the rays being attempted to be indicated by the gradually thinning arrow lines. After an appropriate number of such sheets all of the gamma rays will be scattered and absorbed and none of them can enter inside of the shelter.

The same, of course, will be true of other rays, as has been mentioned.

The corrugated sheets will be spot welded to each other at their portions touching each other, or will be secured by bolts or rivets or by any appropriate methods, as indicated at 51, and each unit 27 will have end walls 52 of appropriate strong metal plates, the ends of the corrugated sheets also being welded to the end sheets as indicated at 53. In this manner each unit will be a unitary structure. The respective plates 52 of the units, as well as the side plates 79 (Fig. 7) and end and curved side plates 60, 60a (Fig. 4), respectively, when a wall, ceiling or the like is to be built from them, as indicated in Figs. 1, 2 and 3, will be secured to one another as by welding or bolts or any other appropriate means.

It will be seen that when force, like that of an explosion, will strike the outermost sheet 32, it will have a tendency to straighten out through its corrugated nature and resiliency and will also have a tendency to transfer the shock to the next sheet, and so in succession, to all the sheets in back of it, and to the concrete or any structural support indicated back of them. In this manner a highly resilient but very strong structure is built of comparatively light units, adapted to resist very strong forces.

The sheets 30 will try to straighten out on account of their corrugated shape and finally will transmit stress to the end plates 52. Such end plates, on the other hand, will receive an opposing stress caused by the straightening tendency of the next unit in my device, wherefore the stresses of the opposing units will practically nullify each other and my device will be extremely reliable and resisting even against the strongest explosion at the outside thereof.

When I build a structure like the one illustrated in Figs. 1 and 2, having corners, I employ a unit generally indicated by the numeral 28 for such corners. This unit, shown on a larger scale in Fig. 4, will be built of curved sheets 57, the outer surfaces 58 of which are mirror finished and the inner surfaces 59 coated by said absorbing material, and the purpose and operation of these sheets 57 is exactly the same as described hereinbefore in connection with the corrugated sheets 30 of my wall units. The rays striking the mirror surfaces will be partly scattered therefrom and the so scattered parts will be absorbed by the coating of the sheet in front of them. The ends of the curved sheets 57 will be secured into end plates 60 and side plates 60a as by welding, indicated at 61, and said end plates 60 will be secured

to the end plates 52 of the wall units and adjacent end plates 60a to one another as by welding, for which welding stubs 61 are indicated in Fig. 4, or by bolts 63, as indicated in Fig. 3, or by any other appropriate method.

Obviously, the end plates 52 of the joining wall units 27 may also be secured by bolts, as also indicated at 63 in Fig. 3.

At the inside of my walls and ceilings I preferably provide a strong reinforced concrete structure 66. I may provide structural steel structures holding steel casings diagrammatically indicated at 64 and 65. No casing is required with reinforced concrete.

Similarly a strong concrete block 67 may be used for the bottom or floor of my device and the lowermost end plates 52 as well as the vertical downward continuations of plates 60a of the walls may be anchored therein, as indicated at 68 (Fig. 3).

In the construction indicated in Figs. 1, 2 and 3, I preferably provide a further layer or filler 69 between the concrete 66 or steel casings 64 and 65 and the innermost corrugated sheet 70. Said layer I make of heat and shock resisting but still highly resilient material like silicon sponge rubber. The purpose of the same is to take up the last remaining shock from an outer explosion transmitted thereto in a greatly reduced manner through the plurality of resilient corrugated sheets.

In case my construction is used for an underground shelter, as indicated in Fig. 2, being surrounded by the earth soil 71, or by existing basement walls and ceiling 71a (dotted lines) then no outer protective layers or plates are necessary for the same. However, when a shelter is to be built above the surface, or in other similar cases, I provide an outer metal plate covering 72 for my device and the space 73 between said covering and the outermost corrugated sheet I fill with an appropriate heat resisting material like asbestos or rock wool. Finally, I provide grounding for the lowermost metal parts of my shelter construction, as indicated in Figs. 2 and 3, said grounding in those instances being provided by rod 74 passing through the concrete block 67 into the soil, and preferably being welded or otherwise secured into a sewer pipe 75 or similar structure whereby the accumulated rays absorbed by the metal structure of my device will be led into the ground. It will be obvious that other rays, like X-rays, and neutrons, and the like, may be similarly scattered and absorbed and grounded by my device.

In case my construction is used for the protection of a new building basement, with the first floor above ground, for the outside wall protection units 27 should be used as in Fig. 3 with the topmost end plate 52 above a reinforced concrete floor, and outer casing 72 and filler 73 reaching below ground. Resilient inner filler will be between the wall units 27 and concrete structure 66 and my top units above a reinforced concrete top. Between the round outside corner units 28 and first wall unit 27 above the reinforced concrete floor will be the first floor wall of the building and the respective end plates 60 and 52 will be anchored through the wall similarly as indicated at 63 in Fig. 3. Above my ceiling units 27 I may employ a layer of sand and the standard finished floor of the building in place of my top casing 72.

In Figs. 1 and 2 at 76 I indicate a preferred construction for an entrance door. Said door preferably will be made of similar units as the wall and will have a strong metal frame therearound closely fitting into its opening but being inwardly and outwardly slidable therein, by any appropriate means well known to those versed in this art. The frame may also have strong members 77 whereby it will press on the wall of the shelter and so resist the force of any outside explosion. In the preferred form of my door it may be slid outwardly into its positions 76a shown by dotted lines, whereupon it may swing open as for instance, to the right side alongside of the wall of the shelter, as indicated by the arrow 78

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swinging on appropriate hinges, also well known in this art.

Water, air and other provisions for the shelter may be stored therein in an appropriate manner, as for instance, in the form of compressed oxygen, and appropriate chemicals may be provided to absorb the foul air, or appropriately designed openings may be provided for the pipe lines and ducts through the floor to introduce the same, said lines and ducts then being screened with means similar to the construction of my side walls.

In Fig. 6 a unit of my wall structure is shown in section, and in Fig. 7 a plan view thereof, the top plate of it having been removed. It will be seen that the unit not only will have end, or top and bottom, plates 52, but also side plates 79. The side plates may have apertures or holes 80 and the top and bottom plates may have holes 81 and appropriate bolts may be passed through those plates for further reinforcing of the structure.

In Figs. 8 and 9 I show a shelter which may have curved or polygonal cross section, and possibly also such ends and fronts or even sides. Indeed, I may make my shelter practically circular in plan and semi-circular in cross section, or polygonal one, approaching such curved contours.

In Fig. 8 the side wall units are indicated by the numeral 82 and the front, and possibly the end, units by the numeral 83. The door is indicated at 83a, generally being of the same construction as has been described hereinbefore in connection with the underground rectangular shelter of Figs. 1 and 2. Units 82 and 83 are constructed in a similar manner to the wall and top units of the shelter of Figs. 1 and 2 and they are shown more in detail in Figs. 10 and 11. They will have corrugated sheets 84 of similar construction and use as described hereinbefore and end plates 85 into which these units are secured. The end plates, however, in such polygonal construction will have an inclination towards each other as necessary and as will be obvious.

When the wall to be built from such units is to have two curvatures, horizontally and vertically, then the side plates 86 of the same will also have appropriate inclinations to one another whereby such structures as the front and rear of the one indicated in Figs. 8 and 9 may be built.

In the embodiment of Figs. 10 and 11 of said units, I alternate the direction of corrugation of the sheets forming the elements thereof, as for instance, the sheets 87 adjacent to the sheets 84, will be placed transversely thereto, then a certain desired number of sheets 88 will again be placed similarly to the sheets 84, and so on the sheets will be placed in alternate layers. In this manner the tensile stresses produced by the resilient corrugated construction will be directed both, towards the end plates 85 and towards the side plates 86, and so transmitted from one unit to another in opposing directions. In the construction of Figs. 8 and 9 also, a concrete layer or block 89 may be used to back up the corrugated metal sheet units and a concrete block 90 for the bottom of the shelter, while the rays may be grounded as indicated at 91 similarly as described hereinbefore.

In Fig. 12, I show my device as employed to protect workers from an atomic pile, the drawing showing a diagrammatic fragmentary horizontal section of such a protection.

As will be seen I provide corner units 92 and wall and top units 27 (Figs. 6 and 7), having similar construction of corrugated sheets as described hereinbefore, these units being enclosed between an interior casing 94 made by graphite brick and an exterior concrete wall 95 and reinforced concrete block roof of the construction. The bottom will be a heavy concrete block 93 if the device is stationary. In case the atom pile is enclosed in a vehicle the bottom wall will be made of units 92 and 27 and the concrete wall and roof will be replaced by an exterior casing. Unit 92 is similar to unit 27 except one end side

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plate 96 of it is placed at 45° for mitre joint. Between the units and graphite brick casing will be a heat resisting material 97 like asbestos or rock wool. The atom pile wall will have peeping holes, small side windows with doors 98 having metal frames and graphite brick refractory lining 99. Gamma ray and neutrons absorbent glass fills a rectangular graphite casing 100 passing through the unit's side, top and bottom plates and extending from the concrete wall 95 through the units, the asbestos layer 97 and the inner casing 94. The units will be secured to one another as described hereinbefore, whereby an extremely strong, still comparatively light construction, is provided for the atom pile.

The arrangement and operation of the parts of this device will be practically the reverse to the one described hereinbefore, that is, the inner surfaces 101 of the corrugated sheet will be mirror finished, while the outer surface 102 of each will be coated by rays absorbing chemicals, some of which have been mentioned hereinbefore. It will be obvious that the rays emanating from an atomic pile housed in my device of Fig. 12 will be partly reflected and partly absorbed in a gradual manner until none of them will reach to the outside. Similarly, the device could protect the atom pile against outside forces or explosions, and finally, the device, if stationary, may have a very deep grounding rod or wire 103.

If a shelter is to be built underground, as indicated in Figs. 1 and 2, then the outermost mirror surface will preferably be coated by a tar layer to protect the mirror effect. Also the inner surfaces 104 of the end plates and as well of the side plates of all my units (Fig. 5) will be mirror finished so that the rays reflected from the curves of the corrugated sheets adjacent to them, as indicated by the arrow 105 will be reflected therefrom and will be caused to be absorbed by the rear coating of the corrugated sheet in front of it as indicated at 106.

Furthermore it will be obvious that not only stationary or permanent shelters may be built according to my invention, but the same may be used for many other purposes. Protecting portable walls or devices may be built when handling X-rays or radioactive materials. Vehicles may be covered by walls or layers built according to my invention, and so protect missiles, trucks, cars, railroad cars, ships and even aircraft. Naturally the protection in such cases may be lighter, that is, as few layers of corrugated sheets may be used as desired. Grounding may be provided for in a similar manner as described hereinbefore, but the grounding wire or block may simply brush on the earth or reach into the water or even ground the rays into the air or clouds through which the aircraft will pass.

In Fig. 13 I show my device as employed to protect a truck or railroad car. As will be seen, I provide wall units generally indicated at 107, top units 108, and bottom units 109 of similar construction of corrugated sheets as described hereinbefore, these units being enclosed by a strong metal frame or casing. The outside cover or casing is indicated at 110 and an inner strong frame at 111. This will be reinforced by bars 112 to receive the shock. The space between cover frame 110 and the outermost corrugated sheet I fill with an appropriate heat resisting material like asbestos or rock wool, as indicated at 113, and between the inner frame 111 and the wall unit I preferably provide a further heat and shock resisting filler 114, still being of a resilient material, like silicon sponge rubber. Said frames or casings will be appropriately secured to one another and the units secured in said frames, whereby an extremely strong, still comparatively light construction is provided. The arrangement and operation of the parts will be practically the same as indicated in Figs. 3 and 5 and described hereinbefore. All the outer surfaces 116 of the frames and the corrugated sheets will be mirror finished, while the inner surfaces 117 will be coated by said rays absorbing material. This strong and resilient construction will

protect the vehicle and the occupants in case of accident also.

One use of my invention may consist in preparing clothing of cloth for persons, the outer surface of which will be prepared of mirror-like finish so as to scatter such rays, and the inner surface will be treated by chemicals to absorb such rays, as mentioned hereinbefore.

While I have shown preferred embodiments of my invention, it is to be understood that changes and variations may be resorted to in the elements, construction and combination of my invention, and I reserve my rights to such changes and variations as are within the spirit of this specification, and the scope of the claims hereunto appended.

What I claim as new and desire to protect by Letters Patent of the United States, is:

1. A radiation and explosive force proof wall comprising an inner layer of concrete, a layer of resilient material at the inner side of the concrete layer, a plurality of stacked frames each having a top plate, a bottom plate, and side plates interconnecting the ends of said top and bottom plates, said top and bottom plates extending at right angles to said layers, and said side plate extending at right angles to said layers and top and bottom plates, and said frames further comprising a plurality of corrugated sheets with the crests of each sheet contacting the troughs of adjacent sheets, and said sheets extending generally at right angles to said top, bottom and side plates, the inner edges of said top, bottom and side plates being embedded in said resilient layer, the bottom plate of one frame contacting the top plate of the next adjacent frame therebelow, a layer of heat resisting material at the outer sides of said frames with the outer edges of said top, bottom and side plates being

embedded in said heat resisting layer, and an outer sheet metal layer contacting the outer side of said heat resisting layer.

2. The combination of claim 1, said top, bottom and side plates being made of metal, and said heat resisting layer being made of asbestos.

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