April 6, 1943. P. H. DAVEY 2,316,055

SHIELD

Filed July 10, 1939 2 Sheets-Sheet 1

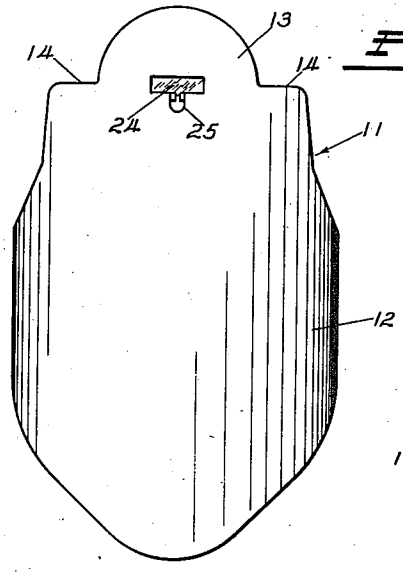


Fig. 1



Fig. 7

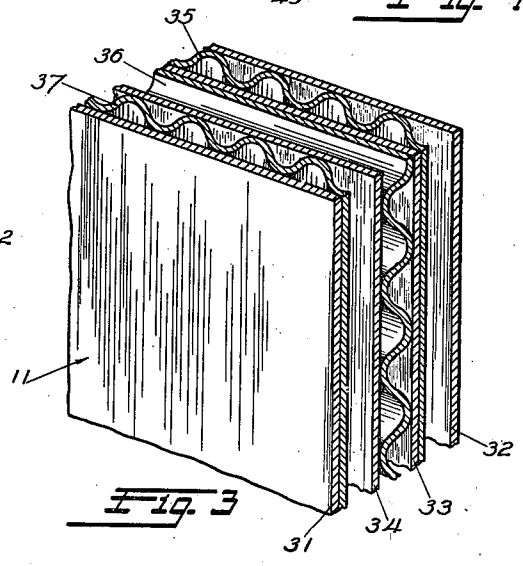


Fig. 3

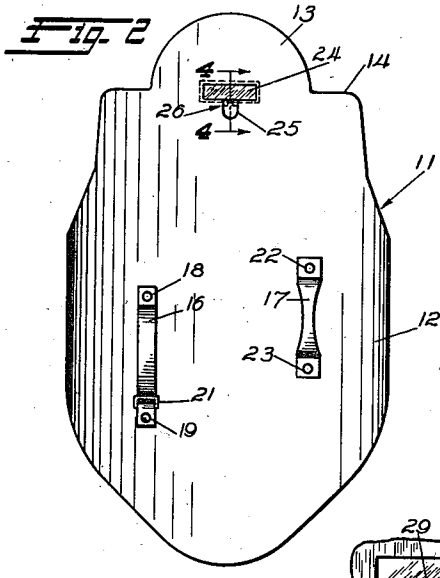


Fig. 2

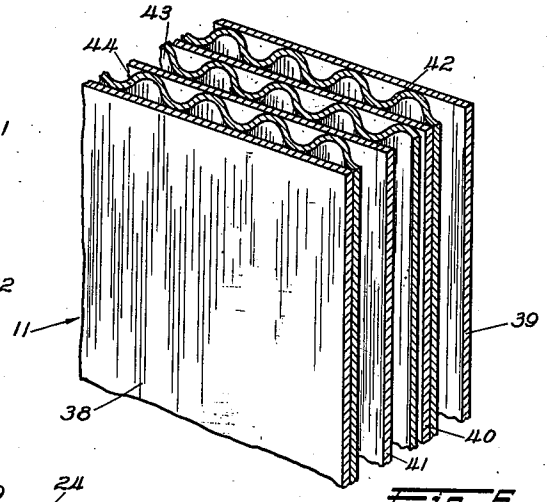


Fig. 6

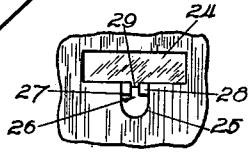


Fig. 5

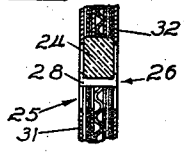


Fig. 4

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SHIELD

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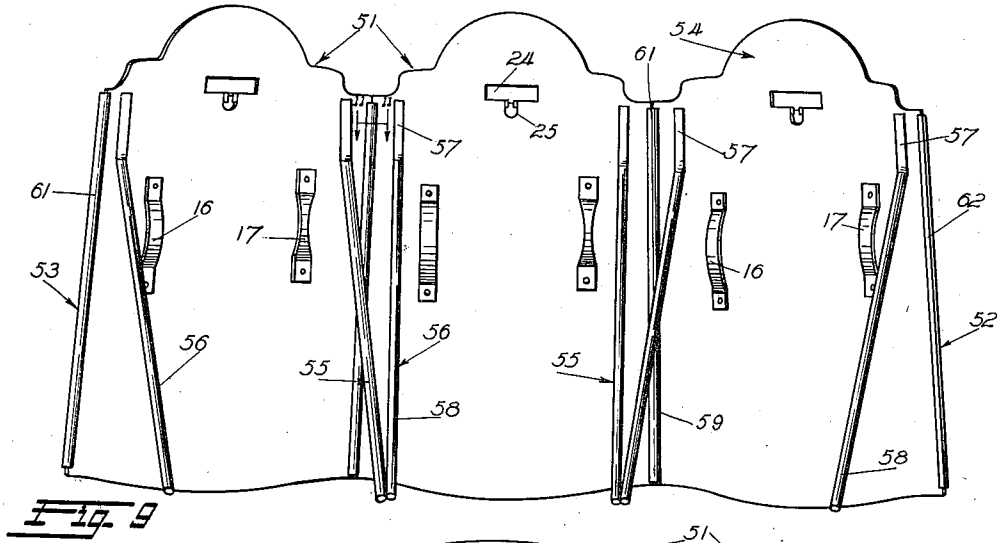


Fig. 9

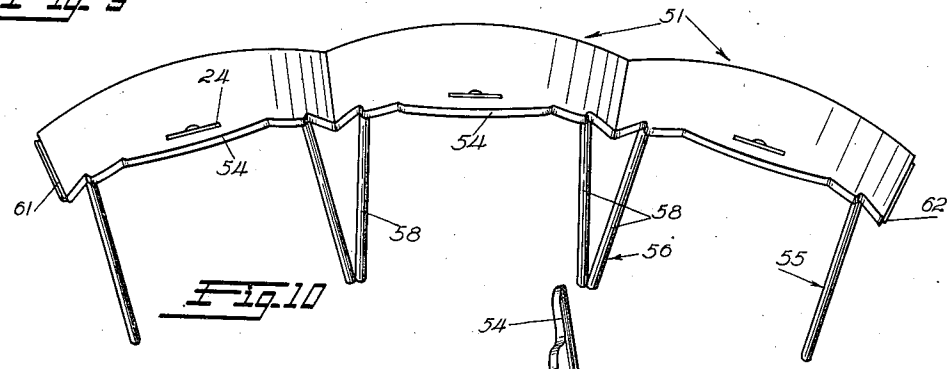


Fig. 10

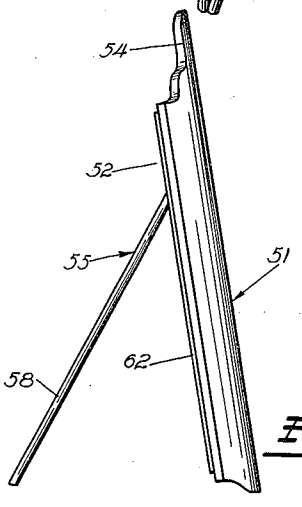


Fig. 8

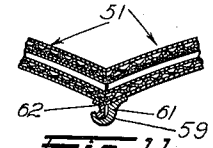


Fig. 11

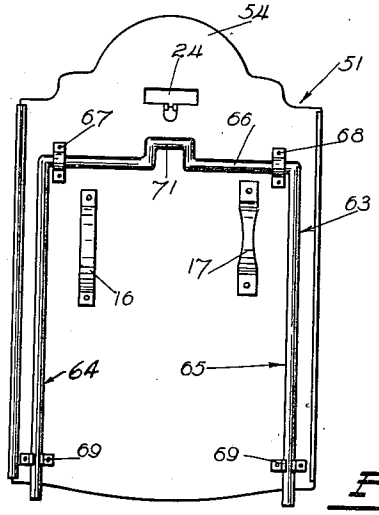


Fig. 12

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UNITED STATES PATENT OFFICE

2,316,055

SHIELD

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Application July 10, 1939, Serial No. 283,679

3 Claims. (Cl. 89—36)

This invention relates to the provision of shields or armor for protection against projectiles, and more particularly to the provision of a portable shield adapted to be carried by a soldier to provide protection against projectiles or bullets of small caliber such as from rifles, pistols and machine guns.

While shields and armor of various types have been proposed heretofore for carriage by and the protection of a single soldier, such devices have proven impractical mainly because of the heavy weight involved and the necessity for holding the weight of the equipment of the combat soldier to a minimum. This heavy weight has been due to the prior designs of shields which were of such constructions as to require large quantities of metal to provide adequate protection against the fire of small arms.

Furthermore in the design of the prior shields, consideration has been given mainly to the protection of the individual and little thought has been given to the maintenance of his fire power and offensive value. In the prior structures no consideration has been given to the soldier's visibility of the attack area and to his use of his firearm while retaining the protection afforded by the shield. In the case of prior shields, it has been necessary for the soldier to expose himself to see the area into which he is advancing and to sight his weapon. Obviously these restrictions of weight and lack of visibility render the use of prior shields impractical in modern warfare.

In overcoming the disadvantages of the prior devices and in providing a thoroughly practical shield for use by a soldier particularly in attack, it is a major object of this invention to provide a novel shield of relatively light weight compared to its protecting power against the fire of small arms, the shield providing the requisite visibility and means whereby the soldier has full exercise of the firearms with which he is equipped.

Still a further object of this invention is to provide a novel portable shield for carriage and use by an individual soldier wherein means is provided for full exercise of the firearms of the soldier without his having to expose himself outside the boundaries of the shield.

A further object of this invention resides in the provision of a shield wherein metal plates of various designs, more specifically corrugated sheets and plane sheets, are combined in a novel manner providing a structure far more resistant to projectiles than a solid metal structure of the equivalent or even greater weight.

Still a further object of this invention is to provide a novel shield structure for protection against projectiles wherein means is provided to both deflect and distort the projectile whereby the resistance offered to its passage through the shield increases materially in proportion to its depth of penetration.

A further object of this invention is the provision in a protective shield of a novel arrangement of corrugated and plane sheets of metal arranged in alternate order with the axes of the several corrugated sheets arranged at selected angles to one another whereby maximum resistance to the passage of a bullet is provided not only by the inherent resistance of the sheets but also by the specific arrangement thereof which causes successive distortions and continued enlargement of the projectile and a series of deflections thereof into different courses.

Still a further object of this invention is the provision of novel means in combination with a protective shield whereby the carrier can effectively use his firearm and accurately sight the same while retaining the protection of the shield.

A further object of this invention is the provision of novel means in combination with a protective shield adapted for carriage by an individual soldier whereby the shield can be readily set up and independently supported on the terrain whereby the soldier can have the free use of his arms and weapons.

Still a further object of this invention is the provision of a novel portable shield for carriage and use by an individual soldier, the shield being so designed that it may be combined with shields of like type carried by other soldiers to form a protecting self-sustaining bullet-proof wall for the protection of a group of soldiers.

Further objects and advantages of the invention will appear from the following description and the accompanying drawings wherein;

Figure 1 is a front elevation of a preferred embodiment of the present invention;

Figure 2 is a rear elevation of the device shown in Figure 1;

Figure 3 is a view in perspective of a section of the device shown in Figures 1 and 2;

Figure 4 is a detail taken in section on the line 4—4 of Figure 2;

Figure 5 is a detail in elevation of the window construction of Figures 1 and 2;

Figure 6 is a view in perspective of a section of a modification of the wall structure shown in Figure 3;

Figure 7 is a section of a modified form of

corrugated plate that may be used in the present invention.

Figure 8 is a side elevation of a modification of the shield of Figures 1 and 2;

Figure 9 is a rear elevation of a number of the shields of Figure 8 combined in a manner to protect several men in a group;

Figure 10 is a plan of the shield assembly of Figure 9;

Figure 11 is a detail in section taken on the line 11—11 of Figure 9;

Figure 12 is a rear elevation of a further modification of the shield of Figures 1 and 2.

Referring to Figures 1 and 2, the illustrated embodiment of the invention is in the form of a shield 11 adapted to be carried by one man for protection against the fire of small arms such as rifles, machine guns and pistols. Shield 11 includes a trunk or body section 12 and a head section 13, the two being joined at the shoulders 14, the shield thus simulating the general outline of the carrier. The shield is preferably rounded about its longitudinal axis to present an arcuate, rounded or partially cylindrically-shaped surface to the front which not only aids in deflecting bullets but also protects the carrier to a considerable extent against cross-fire.

For convenience in grasping and carrying the shield, handles 16 and 17 are provided on the rear face thereof. Preferably handle 16 is made in the form of a leather or fabric strap secured at points 18 and 19 to the shield proper by rivets or other suitable fastening means and having an adjustable buckle 21 so that the length of the strap may be lengthened or shortened as desired. Handle 17 is preferably formed of a rigid metal member fastened at 22 and 23 to the shield proper by rivets, spot welding or similar means and formed in a shape to be conveniently gripped by the carrier.

At a point adjacent head portion 13 of the shield, a transparent window 24 of transparent bullet-proof glass, resin or similar transparent bullet-proof material is preferably provided in conjunction with an aperture 25 therebeneath arranged to receive and support the front end of a firearm such as a pistol or a rifle. Window 24 and aperture 25 are so positioned that it is possible for the firearm to be properly sighted through window 24. To prevent injury to window 24 and possible breakage thereof when the firearm is fired, a shock absorber 26 such as a strip of sponge rubber, fiber or similar shock absorbing material is provided immediately adjacent the top of aperture 25 on the underside of window 24. Shock absorber 26 is preferably formed in two parts 27 and 28 (Figure 5) with a space 29 therebetween so that there will be an uninterrupted line of sight along the weapon. The space 29 between sections 27 and 28 is sufficiently small so that the sections will fully protect window 24 against breakage from the shock of firing the weapon.

Window 24 is preferably secured in the manner shown in Figure 4 which will be hereinafter explained.

Referring to Figure 3 wherein a perspective of a section of the shield of Figures 1 and 2 is shown, the shield is preferably formed of a series of alternately arranged corrugated metal sheets and plane metal sheets. In the section shown, plane metal sheets are employed at 31, 32, 33 and 34, and corrugated sheets at 35, 36 and 37. The sheets may be fastened together by spot welding at the points of contact, by bolts or other forms of well-known fastening means.

In the structure shown in Figure 3, it is preferred that the individual adjacent sheets of corrugated material have the axes of their corrugations running at angles to one another, preferably at right angles. For example the corrugations of plate 35 are at a right angle to the corrugations of the next adjacent corrugated plate 36. If desired, in the use of three corrugated sheets to form the section, the corrugated sheets may be positioned with the corrugations at angles of 45 degrees to one another.

Preferably the sheets are formed of relatively light metal to insure that shield 11 is correspondingly light, the metal selected being of the type commonly known as stainless steel. Such material is desirable because it is comparatively tough and readily obtainable. However, it is to be understood that other material, such as special armor plate material and the like may be employed. If desired, the material employed may be heat treated to harden special portions such as the surfaces of the sheets.

The corrugated sheets may be made with the corrugations rounded at the ponits of bend as in Figure 3 or may be made sharply angular as shown in Figure 7 at 45. In either case the corrugations are preferably so pitched that the sides of the corrugations form angles approximately 45 degrees with the sides of the plane sheets.

In the modification shown in Figure 6, plane sheets 38, 39, 40 and 41 are provided, between which are secured corrugated sheets 42, 43 and 44. In this modification, the corrugations of all of the sheets run in the same direction, the sheets being held together as by spot welding or similar means. It is to be understood that corrugated sheets of the type shown at 45 in Figure 7 may be used in this modification as well as the sheets shown.

In mounting window 24 in shield 11, it is preferred to employ the arrangement shown in Figure 4, wherein a recess is formed to receive window 24 by cutting a hole in the shield to form an aperture and cutting away the interior plates so that portions of the flat side plates 31 and 32 project beyond the other plates in the section to form receiving means or a pocket for window 24. Shock absorber 26 may be adhesively or otherwise secured to the lower face of transparent window 24 and is similarly received in extended portions of sheets 31 and 32.

Figures 8 to 10, inclusive, illustrate a modification of the shield of Figures 1 and 2, the structure being such that the shield may be supported independently of the soldier and may be combined with a number of like shields to protect a group of soldiers.

The shield generally indicated at 51 is similar to shield 11 in cross-sectional construction and in general outline except that the sides 52 and 53 are straight and extend substantially the full length of the shield except for the head protecting portion 54. Handles 16 and 17 are provided as on the shield of Figure 2 as well as sighting window 24 and aperture 25.

To permit the positioning and support of shield 51 while leaving the soldier free use of his hands and arms, shield 51 has two legs 55 and 56 secured to the rear face thereof. Each of legs 55 and 56 comprises a portion 57 welded, riveted or otherwise secured to the rear face of the shield and a portion 58 extending away from the back of the shield, the two legs 55 and 56 thus con-

stituting a tripod with the lower edge of the shield which effectively supports the shield against the successive impact of bullets to which it may be subjected.

Figures 9 and 10 illustrate the manner in which a number of shields of the type shown in Figure 8 may be combined to provide protection for a group of soldiers. Each shield 51 is provided at its left side 53 with a bent-over portion 59 defining a groove 61. At its right side 52, each shield is formed with a tongue 62 of a shape to readily engage groove 61. This arrangement provides a tongue and groove connection whereby two or more of said shields may be readily combined to form a continuous wall and protect a group of soldiers. The nature of the tongue and groove connection is such that the shields can be readily disengaged when they are desired for individual use.

As shown in Figure 11, the tongue and groove connection is preferably formed entirely of the plate forming the rear wall of the shield and is entirely located at the rear of the shield so that it is protected by the walls of the latter.

While legs 55 and 56 can be rigid with respect to shield 51 as shown in Figures 9 and 10, they may be so arranged that they can be folded flat with the rear face of the shield when not in use, this arrangement being shown in Figure 12.

In Figure 12, a U-shaped rod or similar member 63 is provided, the two legs 64 and 65 of the U constituting legs for the support of the shield. The bend 66 of the U-shaped rod is pivotally secured to the back of the shield as by brackets 67 and 68 secured to the shield by welding, riveting or similar means. To maintain legs 64 and 65 flush with the rear face of the shield and out of the way of the carrier when the shield is being carried by handles 16 and 17, spring clips 69, welded, riveted or otherwise secured to the rear face of the shield, are preferably provided. When the shield is being carried, legs 64 and 65 are thus held tight against the rear face of the shield.

When it is desired to support the shield on the ground, it is dropped down until legs 64 and 65 are in firm contact with the ground. Then by a sharp blow of the knee, the lower edge of the shield is brought forward and legs 64 and 65 sprung out of clips 69. The shield is then moved forward and downward until its bottom edge is in contact with the ground.

To prevent legs 64 and 65 from coming out too far with respect to the shield and to insure that they are spaced properly from the lower edge of the shield, the bend 66 of U-shaped rod 63 is properly provided with a U-shaped bent portion 71 which constitutes a projecting lug. By reason of the bowed shape of shield 51, lug 71 as well as the central portion of bend 66 is out of contact with the rear face of the shield when legs 64 and 65 are folded in. As legs 64 and 65 are sprung outwardly, portion 66 will rotate lug 71 toward the rear face of the shield which it will contact when legs 64 and 65 are out the proper distance. Contact of lug 71 with the shield insures against legs 64 and 65 being sprung out too far to properly support the shield.

When a flat shield rather than a bowed shield is used, lug 71 is so positioned that it projects outwardly at an acute angle to the rear face of the shield when the legs are folded in. Then when the legs are moved outwardly, bend 66 will rotate until lug 71 contacts the rear face of the shield.

The structure disclosed herein has proven to be particularly efficient against small calibre bullets, such as are used in the .30 calibre rifle now in common use in the United States Army. Through actual tests it has been found that bullets fired from a distance of approximately fifty yards will not penetrate the material but will be caught by the shield and retained therein.

This unexpected efficiency as a shield together with the extremely light weight which the construction of this invention makes possible is believed due in part to the arrangement wherein a series of corrgated sheets are employed in combination with a series of plane sheets therebetween.

From an analysis of experiments conducted on the shield of this invention, it has been found that a bullet is deflected a number of times in passing through a portion of the shield and is distorted at the same time so that more resistance is offered to its continued progress in proportion to its increase in size. For example, a bullet passing through the plane sheet 31 (Figure 3) would be reduced to some extent in velocity and immediately upon contacting the corrugated sheet 37 would be deflected in its course. The passage of the bullet through the plane sheet 31 and the deflection of the bullet by the corrugated sheet 37 when it passes therethrough not only causes the bullet to change its shape but also to actually turn sideways to some extent so that the bullet upon encountering sheets 34 and 36 has more surface area contacting the sheets. Consequently the sheets offer more resistance to the continued passage of the bullet. Sheets 34 and 36 function to further distort the bullet and to deflect its course so that by the time it reaches sheets 33 and 35, the velocity of the bullet is almost entirely spent and it is usually retained between these sheets. In a very few cases, it has been found that the bullet has retained sufficient velocity to slightly indent the sheet 32.

The use of plane sheets such as sheets 21, 32, 33 and 34 between the respective corrugated sheets is of particular value in that it prevents the adjacent corrugated sheets from folding into one another and materially assists in turning and deforming the bullets.

In the modification shown in Figure 6, a like effect in distortion and deflection of the bullet is secured by arranging the corrugated sheets so that the respective corrugations thereof all run in the same direction. This modification is of particular advantage when it is desired to bend shield 11 in an arcuate shape as shown in Figures 1 and 2 although it is to be understood that the shield may be bent or rounded with a construction as shown in Figure 3.

The unexpected efficiency of the shield of this invention also is believed to be due in part to the fact that the successive sheets and intervening spaces therebetween, which are preferably left free of any material, provide an intermittent snubbing action on the bullet comparable to the proper method of applying brakes on an automotive vehicle when descending a grade. As is well known, the brakes under such circumstances should be applied hard for very short intervals of time rather than applied steadily. In the case of the present invention, the bullet is subjected to a sereis of extremely resistant obstructions with intervening spaces therebetween. Each obstruction exerts a sharp-acting retarding force on the bullet which not only acts to deflect the bullet in its course but also to distort the

bullet, the deflection of the bullet by successive layers or sheets being increased as the bullet penetrates further into the shield because of the deformation and increased area of the bullet.

The deflection provided by the shield of the present invention is particularly effective by reason of the provision of the corrugations at angles of relatively 45 degrees to the planes of the plane sheets. In its contact with the first corrugated sheet, it has been found that the bullet is usually deflected about 5 to 10 degrees which causes it to approach the next plane sheet at an angle of about 5 to 10 degrees and be again deflected. On leaving that plane sheet, it is again deflected by the succeeding corrugated sheet at approximately 5 to 10 degrees and stlil another 5 to 10 degrees by the succeeding plane sheet. This continued deflection insures an absorption of a considerable part of the momentum of the bullet by the shield in directions transverse of the shield and consequently reduces the penetrating ability of the bullet.

In action, the shield 11 is sufficiently light to be carried by a single soldier, the arm of the soldier being inserted under the strap 16 with the hand gripping the handle 17. The head and trunk of the soldier are then fully protected. A rifle or pistol can be inserted in the aperture 25 and be sighted through window 24, the damage to window 24 from the firing of the rifle or pistol being prevented by the shock absorber 26.

It is believed obvious that the present shield is of immense advantage in an advance and not only protects the soldier to a considerable extent from small calibre bullets such as those from rifles, pistols and machine guns, but also enables him to effectively reply to such fire. The shield has a further moral advantage in that the soldier is conscious of a certain amount of dependable protection at all times and is accordingly more aggressive. The shield is also of immense advantage when used by grenadiers since it may be used effectively by them to approach close to an objective and hurl their grenades from behind the shield. Since the right arm of the carrier is always free, the shield being effectively supported by the left arm alone, the right arm can be used to throw the grenades in the usual manner.

While the present invention has been described in connection with a one-man shield, it is to be understood that this description is purely illustrative and the principles of the inventoin may be applied to armor or shields for other purposes such as on tanks, armored cars, ships and the like.

The invention may be embodied in other specific forms without departing from the spirit or essential characteristics thereof. The present embodiment is therefore to be considered in all respects as illustrative and not restrictive, the scope of the invention being indicated by the appended claims rather than by the foregoing description, and all changes which come within the meaning and range of equivalency of the claims are therefore intended to be embraced therein.

What is claimed and desired to be secured by United States Letters Patent is:

1. A shield of a type adapted to be carried by an individual for protection against the fire of small arms, means on said shield whereby it can be conveniently grasped and supported during movement of said individual, means on said shield whereby it can be stationarily supported independently of said individual, and means on said shield whereby said shield can be connected with one or more shields of a similar type to form a protecting wall for a number of individuals including a tongue on one side of said shield and a groove on the opposite side whereby adjacent shields may be connected by a tongue and groove connection, the latter being arranged to lie entirely behind the wall formed by said shields.

2. A shield of the type described, provided with an aperture, a transparent window mounted in the upper part of the aperture, the lower part of said aperture being adapted to receive a firearm, and means in said lower part of the aperture adjacent the lower edge of said window to absorb the shock of firing the arm to prevent injury tc said window while permitting said arm to be sighted, said means being formed in spaced sections to permit of an uninterrupted line of sight on said firearm through said window.

3. A shield of the type described, provided with an aperture, a transparent window mounted in the upper part of the aperture, the lower part of said aperture being adapted to receive a firearm, and means in said lower part of the aperture secured to the lower edge of said window to absorb the shock of firing the firearm to prevent injury to said window while permtiting said arm to be sighted, said means being formed in spaced sections to permit of an uninterrupted line of sight on said firearm through said window.

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