

April 6, 1943.

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2,315,799

SAFETY DEVICE FOR HANDLING EXPLOSIVES

Filed June 12, 1941

5 Sheets-Sheet 1

Fig. 1.

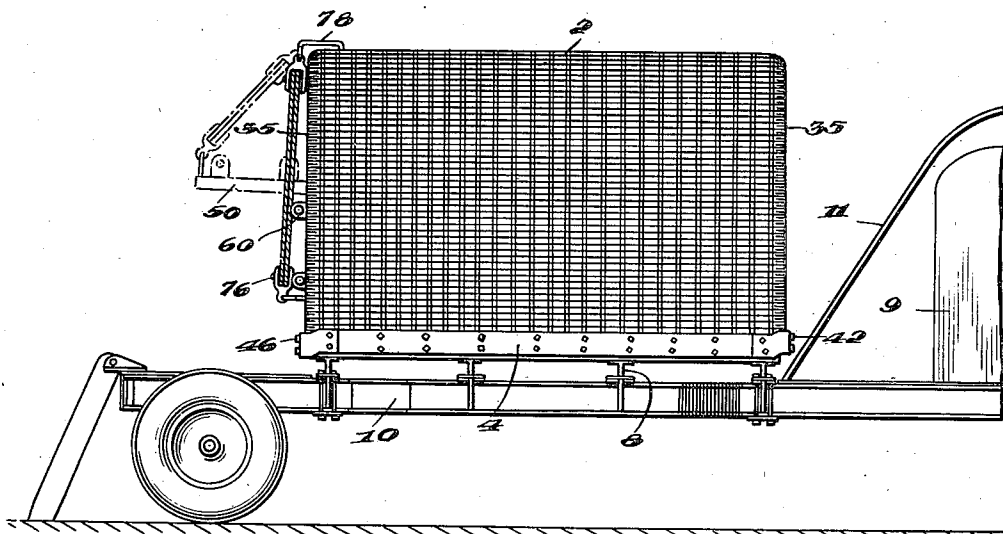


Fig. 2.

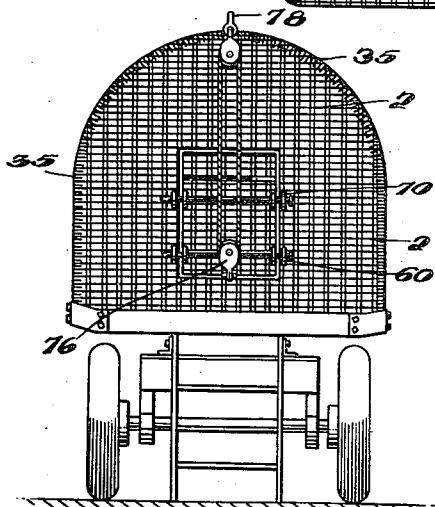
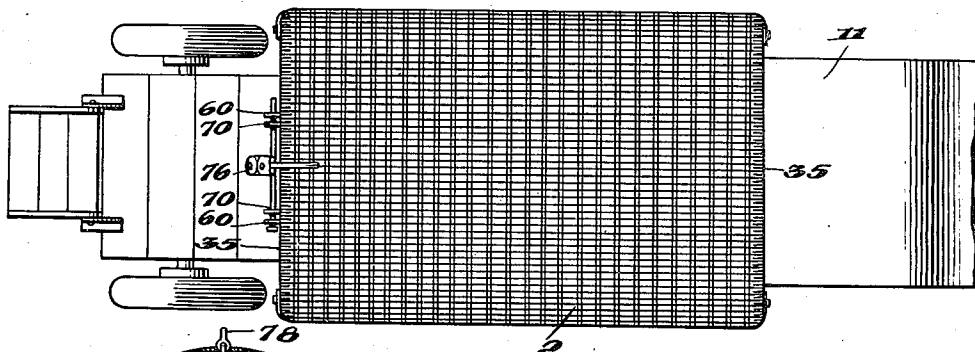


Fig. 3.

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5 Sheets-Sheet 2

Fig. 5.

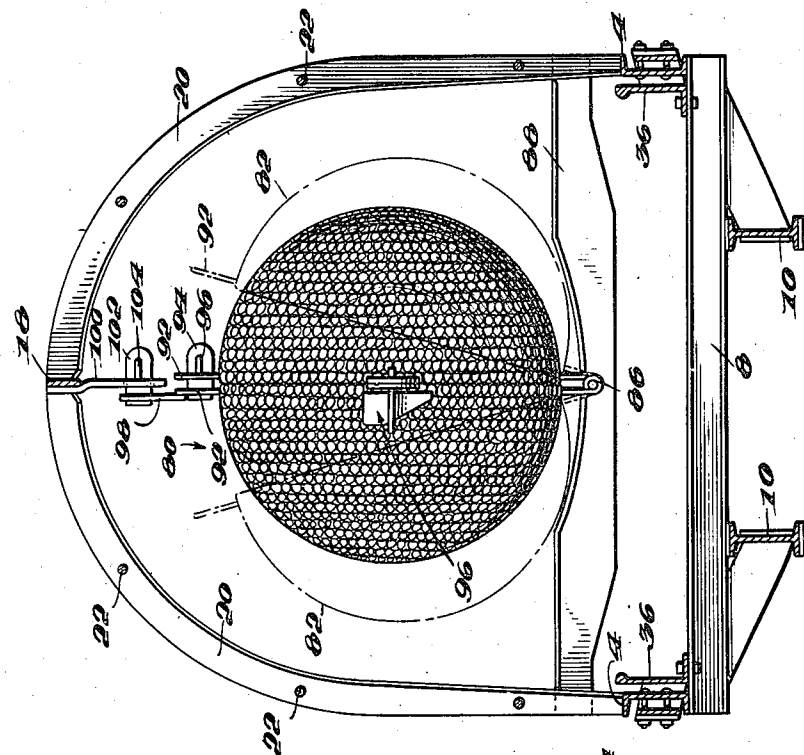
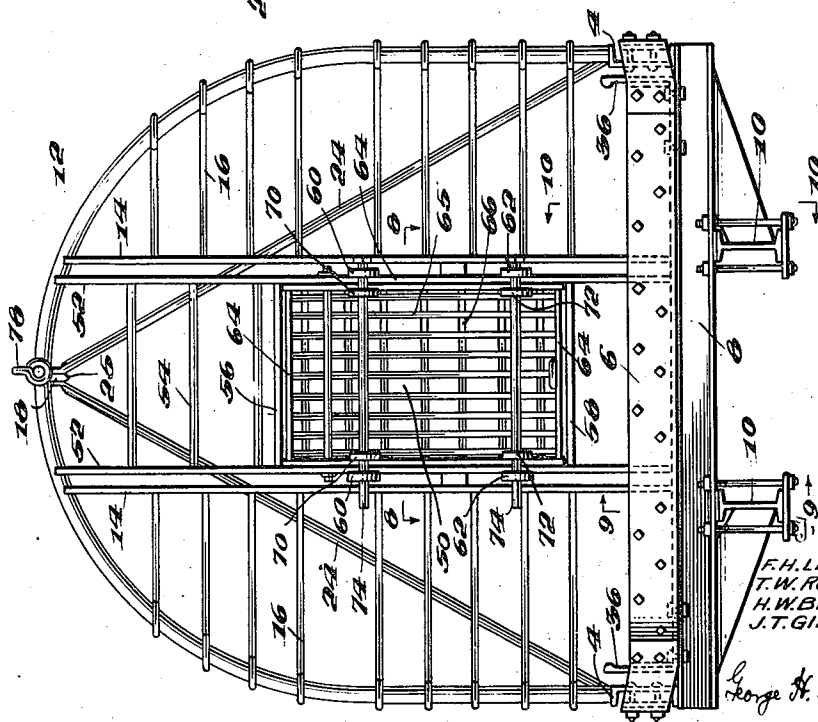


Fig. 4.



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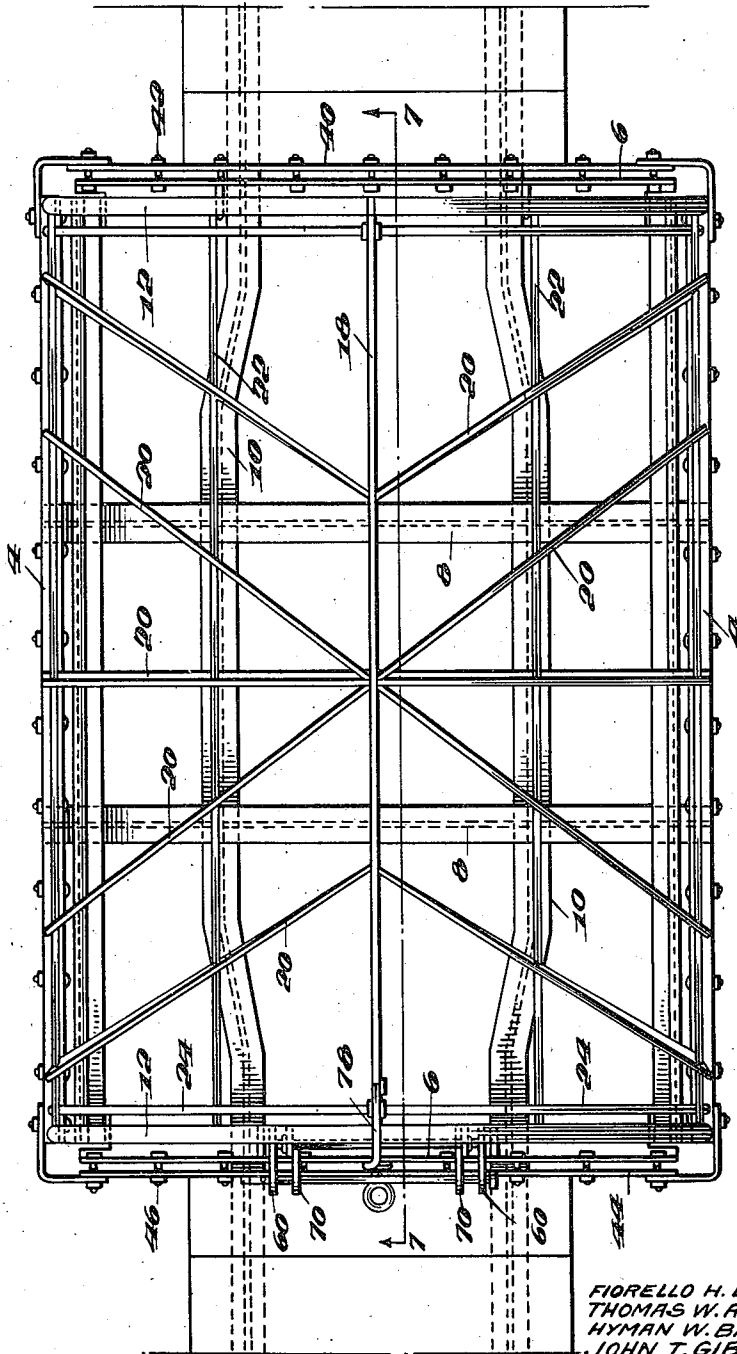
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5 Sheets-Sheet 3

Fig. 6.



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5 Sheets-Sheet 4

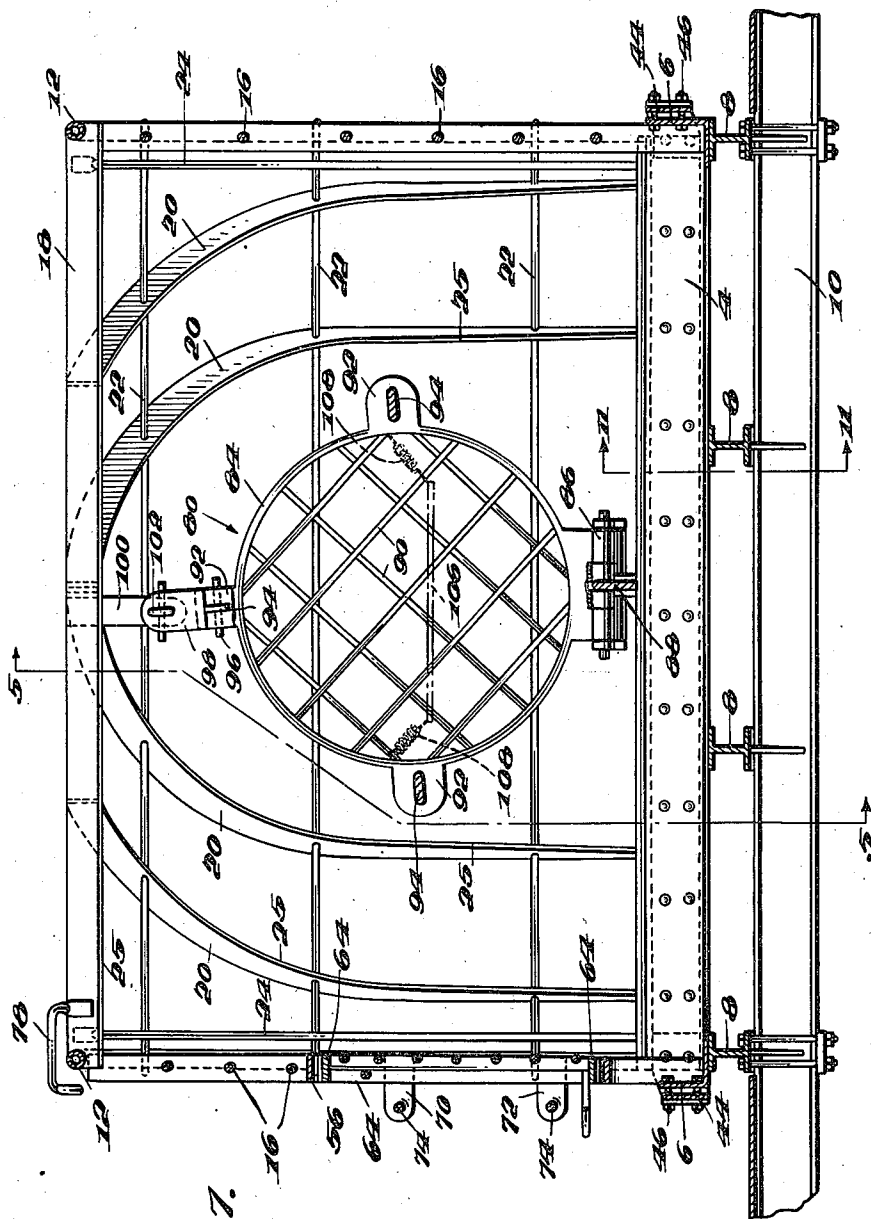


Fig. 7.

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5 Sheets-Sheet 5

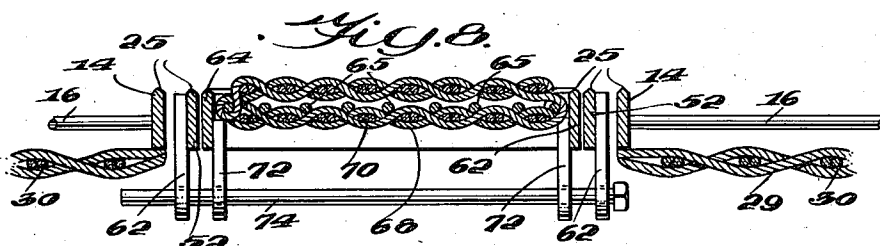


Fig. 10.

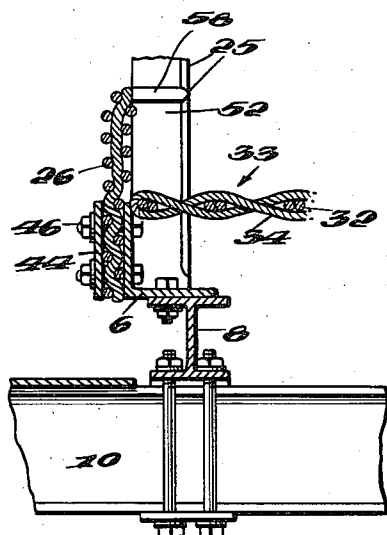


Fig. 9.

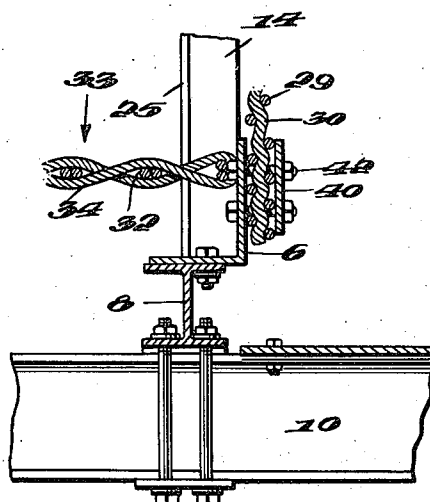
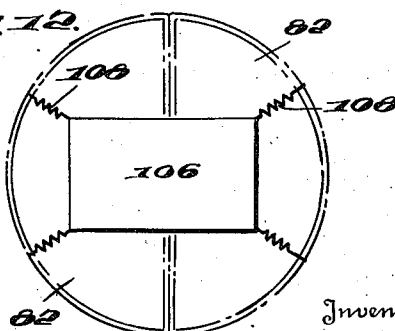


Fig. 12.



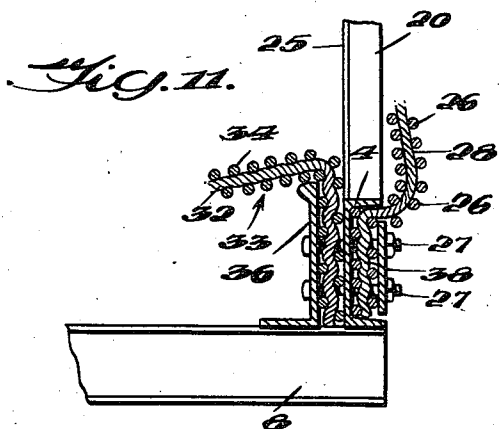
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UNITED STATES PATENT OFFICE

2,315,799

SAFETY DEVICE FOR HANDLING
EXPLOSIVES

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Application June 12, 1941, Serial No. 397,828

21 Claims. (Cl. 109—1)

This invention is an improvement in safety devices for handling explosives and comprises more particularly an enclosure in which an explosive, such, for example, as an infernal machine, or a time bomb, may be placed as soon as found, so that in the event of a premature explosion thereof, there will be no resultant injury to persons or damage to property in the vicinity.

The more important features and objects of the invention are:

1. To provide a strong enclosure, for an infernal machine or time-bomb, constructed of steel open-work, the mesh of which will allow the gases of an explosion to escape but will retain the bomb fragments. Injury to persons and damage to property from flying fragments are thereby prevented, while the fragments themselves may be examined and studied by bomb squad experts for possible clues.
 2. To take advantage of the known fact that the gases from an explosion travel radially in all directions, by providing a support for the explosive in the central part of an inner spherically shaped explosion chamber, said support being spaced away from the walls of the inner chamber, and by positioning this inner chamber in the central part of an outer explosion chamber so that the inner explosion chamber will in turn be separated by a substantial air space and from the walls and floor of the outer explosion chamber. This outer chamber, for practical reasons, cannot well be made spherical but it is made to conform as nearly thereto as possible by curving the roof and floor thereof.
 3. To provide an apparatus capable of being mounted on a truck or trailer, so that it may be moved quickly to wherever it is needed to pick up the bomb or infernal machine, and moved rapidly to carry away the same to an isolated or protected place. Thus, the possibility of the explosion occurring while the bomb is being carried through city streets is minimized, and if an explosion should occur, little, if any, damage would result.
 4. To provide means for opening and closing the inner and outer chambers quickly, so that the explosive may be placed therein and thereafter removed therefrom with a minimum of effort and delay.
 5. To provide a frame having web members placed edgewise to the travel of the radially expanding gases, for minimizing resistance and thus allowing the rapid dissipation and escape of such gases without damage to the structure.
 6. To interlace the walls of the outer chamber and anchor them to the frame so that the meeting edges of the walls are as strong as the walls and are securely anchored thereto.
 7. To anchor the walls and floor of the explosion chamber by bolts which are in shear.
 8. To provide an improved balanced door, held by bolts which are in shear at multiple points.
- Other features and objects of the invention will be developed in connection with the following detailed description of one embodiment of the apparatus, as illustrated in the accompanying drawings. In these drawings:
- Fig. 1 is a side elevation of the explosive carrier of the present invention;
- Fig. 2 is a top plan view of Fig. 1;
- Fig. 3 is an end view, in elevation, taken from the left of Fig. 1;
- Fig. 4 is an end elevation, like Fig. 3, on a larger scale, showing the framework of the outer chamber or canopy;
- Fig. 5 is a vertical, sectional view, taken on line 5—5 of Fig. 7;
- Fig. 6 is a top plan view, showing the framework of the outer chamber;
- Fig. 7 is a longitudinal sectional view, showing the framework of the inner and outer chambers;
- Fig. 8 is an enlarged section on line 8—8 of Fig. 4;
- Fig. 9 is an enlarged section on line 9—9 of Fig. 4;
- Fig. 10 is an enlarged section on line 10—10 of Fig. 4;
- Fig. 11 is a vertical section on line 11—11 of Fig. 7; and
- Fig. 12 is a plan view of a detail.
- Referring to these drawings, in which similar reference characters indicate similar parts, the enclosure of the present invention comprises an outer explosion chamber indicated generally at 2, shaped somewhat like the canopy of a covered wagon, in that it is on an inverted U-shaped frame and is mounted on a wheeled carrier. It may be regarded as approximately semi-cylindrical in shape. The frame for the canopy 2 is in turn supported by a rectangular frame comprising side plates 4 and end plates 6, this frame being supported on transverse beams 8 which are mounted on the longitudinal beams 10 of a wheeled vehicle such as a trailer or motor truck. The cab 9 of the truck is protected by a heavy flexible metallic shield 11.

The canopy 2 is of open-work construction and is made of strong and heavy metallic cables such, for example, as are used to hoist elevators or in blasting mats. The cables are woven as in blasting mats to form a canopy which, by virtue of its open-work construction, will allow gases resulting from an explosion to escape, the mesh, however, of the canopy being sufficiently small so that it will catch and retain any flying fragments.

The supporting framework for the canopy 2 will now be described. The side beams 4 and end beams 6 form a rigid rectangular floor frame and at each end of this frame there is mounted an inverted U-shaped member 12, conveniently made of heavy pipe. The lower ends of members 12 are preferably welded to the side beams 4.

The end frames also comprise a plurality of heavy, vertical web or strut members 14 extending between the pipes 12 and the end beams 6, the upper and lower ends of these struts 14 being secured by welding. Heavy, transverse rods 16 extend horizontally from the pipes 12 to the standards 14 for completing the framework at each end.

The intermediate framework comprises a "ridge pole" member 18 extending between the pipes 12 and secured thereto. This member 18 is a flattened web and is placed edgewise with respect to the upwardly travelling gases. Extending upwardly from the side beams 4 are a plurality of curved, web-like ribs 20, the lower ends of which are welded or otherwise secured to the beams 4, while the upper ends are welded to the ridge member 18. It should be noted that the webs 20 are curved upwardly and converge inwardly, so as to be edgewise to the radially expanding hot gases escaping from the centrally positioned inner explosion chamber 30, to be described later. This edgewise arrangement is important, because the hot gases are travelling rapidly and are at high pressure, and the webs, in effect, "cut through" such hot gases and offer a minimum of resistance thereto. The rib members 20 are further braced by heavy horizontally and longitudinally extending rods 22 which are secured at their ends to the end frame members 12 and which pass through holes in the ribs 20, being welded thereto at such points. The lower or leading edge of the ridge member 18 and the inner edges of the web frame members are beveled or chamfered to a narrow edge, as shown at 25, in order to "cut through" and thus offer the minimum resistance to the radially expanding gases, which otherwise might distort or rupture these frame members.

The framing at each end is strengthened and completed by diagonally extending struts 24, secured to the side plates 4 at their lower ends and to the ridge member 18 at their upper ends. There is thus provided a frame which supports the canopy 2.

The canopy or enclosure 2, having the general attributes and construction of a blasting mat, comprises horizontally extending cables 26 interwoven with vertically extending cables 28 (see Fig. 11). The ends of the enclosure are similarly formed of horizontally extending cables 29 interwoven with vertically extending cables 30 (see Fig. 9). The side and end portions of the enclosure 2 meet at the pipe 12 and are anchored to each other and to the pipe 12 by supplementary cables 35 which are interlaced with the side and end portions of the enclosure, such cables also encircling the pipe 12. It will be un-

derstood that this particular fastening just described is merely illustrative and that any other suitable type of anchorage and attachment for the side and end portions of the canopy may be used.

The floor 33 of the enclosure just described is formed by a blast mat or the like of similar open-work construction comprising the usual warp strands 32 and weft strands 34, woven in open-work construction and made of heavy metallic cable, half an inch or an inch or more in diameter. Referring to Fig. 11, the floor 33 and the side wall of the canopy are respectively clamped against the vertical web of the beam 4 by a clamp plate 36 engaging against the edge of the floor and a clamp plate 38 engageable against the lower edge of the canopy 2, the parts described being clamped very securely together by the clamping bolts 27, which are in shear.

These bolts are placed in shear for the specific purpose of preventing parts thereof from flying into space in the event of bolt failure, caused by an unusually heavy explosion.

The floor 33 is so suspended as to sag slightly, like a hammock, as shown in Fig. 11.

It is to be understood that the invention is not limited to any particular kind of mesh or open-work. The essentials are that the canopy 2 and floor 33 and the inner explosion chamber 30, to be described later, be made of very strong cables, to resist explosive forces, that the mesh shall be sufficiently open to allow the escape of explosion gases but sufficiently close for catching and retaining flying fragments.

The lower edge of the front wall of the enclosure 2 is held against the vertical web of front beam 6 by a clamping plate 40 and clamping bolts 42. Similarly, the lower edge of the wall at the other end is clamped to beam 6 by a clamping plate 44 and clamping bolts 46. Bolts 42 and 46 are in shear, for the reasons stated above.

In order to give access to the explosion chamber 2, a door 50 is provided at one end thereof. The frame of the door is formed by vertical web members 52, Figure 8, extending between pipe 12 and the lower end beam 6, these webs being braced apart by horizontal struts 54, certain of which, such as 56 and 58, form upper and lower sills for the door. The inner edges of these parts are also chamfered, as at 25. Welded to each of the webs 52 and extending outwardly therefrom are two upper brackets 60 and two lower brackets 62.

Referring to Fig. 4, the framework of the door 50 is formed of vertical and horizontal webs 64, the space within the frame of the door being crossed by vertical rods or struts 65 and horizontal rods or struts 66, welded to each other where they cross, and to the frame, for forming a rigid door. Cables comprising lateral strands 68 and vertical strands 70 are interwoven to form an open-work mesh and are also interwoven with and supported by the horizontal and vertical struts 65 and 66.

The vertical sides of the door are provided with upper brackets 70 and lower brackets 72. Each group of four upper brackets 60 and 70 and four lower brackets 62 and 72 are provided with aligning apertures for receiving a locking rod 74. Where this rod 74 passes through a bracket there are provided two points of shear and inasmuch as each rod 74 goes through four brackets, eight points of possible shear are provided.

Since the door is quite heavy, a block and

tackle arrangement indicated generally at 76 may be provided for raising and lowering the door, the upper block being supported by the arm 78.

The door may be hinged or not, as desired. As shown, it is hinged or pivoted on the rod 79, mounted in suitable apertures in the vertical frame members 52.

Instead of the single canopy and single floor so far described, either or both of these may be made double, if desired, for greater strength.

There has thus far been described the outer vault or canopy, which could serve as an explosion chamber, especially if the double thickness construction just described is used. However, the invention preferably comprises an inner explosion chamber mounted substantially centrally within the outer chamber that has just been described, and spaced both from the walls and the floor of the outer chamber.

This inner chamber, in which the explosive is placed, is preferably spherical in shape as indicated generally at 80 (see Figs. 5 and 7). This inner chamber is composed essentially of two hemispherical members 82, each of said members comprising a main circular frame member 84. These frame members 84 are hinged together at their lower edges by a heavy hinge indicated at 86. The chamber 80 is supported on one or more transverse beams 88, for supporting the enclosure some distance above the blast mat floor 33 of enclosure 2.

Each hemisphere 82 comprises curved criss-cross framing rods 90 welded to each other where they cross, and welded at their ends to circular member 84 thereby forming a very rugged semi-spherical frame. This frame is covered by some suitable form of open-work mesh construction, as shown in Fig. 5, the cables being intertwined or interlinked in any convenient manner for providing a mesh construction sufficiently open to allow the escape of hot high-pressure gases, but sufficiently close to retain flying fragments.

In order to lock the two halves 82 closed, there are provided cooperating outwardly extending brackets 92, arranged in cooperating pairs. One bracket has a slot for receiving a locking plate 94 carried by the opposite bracket of the pair. A latch 96 cooperates with locking plate 94 to lock the two halves together after the explosive has been placed therein. In order to further stabilize the inner chamber 80 there may be provided a bracket 98 provided with an aperture which registers with another aperture in a downwardly extending bracket 100 supported from the ridge member 18, brackets 98 and 100 being held together by a latch plate 102 and latch plate 104.

In use, the explosive is put into the chamber 80 and preferably placed on a support or cradle 106 made of wire mesh hung from the walls of the chamber 80 by coil springs 108. With the explosive in place on the support 106, near the center of chamber 80, the chamber 80 is closed and locked and then the outer door 50 is closed and locked and the explosive taken to a remote place as quickly as possible for further examination. However, any explosion that might take place prior to such examination would be relatively harmless because of the strength and gas-permeability of the inner and outer chambers. It is important, of course, in dissipating the force of an explosion to allow the hot gases of the explosion to expand and cool as rapidly as possible

and this is permitted by the open mesh construction of the inner and outer chambers. It is, of course, equally important that there be no flying fragments, first because of danger to life and property from such fragments and, secondly, because of the value of such fragments as clues for tracing the maker of the infernal machine or bomb.

It would be possible, under certain conditions, to omit the inner chamber, and rely on outer chamber 2, or to omit the outer chamber and rely on the inner chamber 80. However, the explosive force of the bomb or infernal machine is an unknown quantity, and for this reason the use of both the outer chamber 2 and inner chamber 80 is preferred, as providing a greatly increased factor of safety.

While the present preferred embodiment of the invention has been described in some detail, it should be understood that the invention is not limited to the precise details that have been described, but may be carried out in other ways.

We claim as our invention:

1. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, comprising an explosion chamber, completely enclosed, of open-mesh construction formed of heavy metallic intermeshed cables and including a floor and canopy, the mesh permitting escape of the explosion gases but serving to retain fragments resulting from an explosion, and means for supporting the explosive spaced from the floor and canopy.

2. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, a floor frame, and a roof frame of inverted-U construction supported thereby, certain of the members of the roof frame being flattened and placed edgewise to the path of the gases resulting from an explosion, a floor supported by the floor frame, a canopy supported by the roof frame, said floor and canopy being of heavy, interlaced metallic cables, providing an openwork construction coarse enough to permit the rapid escape of explosion gases but fine enough to retain fragments caused by the explosion.

3. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, a floor frame, and a roof frame of inverted-U construction supported thereby, certain of the members of the roof frame being flattened and chamfered at their leading edges, and placed edgewise to the path of the gases resulting from an explosion, a floor supported by the floor frame, a canopy supported by the roof frame, said floor and canopy being of heavy, interlaced metallic cables, providing an openwork construction coarse enough to permit the rapid escape of explosion gases but fine enough to retain fragments caused by the explosion and means for holding the explosive spaced from the floor and canopy.

4. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, a floor frame, and a roof frame of inverted-U construction supported thereby, certain of the members of the roof frame converging toward each other as they approach the top, central part of the frame and being flattened and placed edgewise to the path of the gases resulting from an explosion, a floor supported by the floor frame, a canopy supported by the roof frame, said floor and canopy being of heavy, interlaced metallic cables, providing an

openwork construction coarse enough to permit the rapid escape of explosion gases but fine enough to retain fragments caused by the explosion.

5. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, a floor frame, and a roof frame of inverted-U construction supported thereby, a floor suspended by and across the floor frame so as to hang in a hammock-like curve, a canopy supported by the roof frame, said floor and canopy being of heavy, interlaced metallic cables, providing an openwork construction coarse enough to permit the rapid escape of explosion gases in all directions but fine enough to retain fragments caused by the explosion.

6. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, comprising a framework defining an enclosure, walls covering said framework, made of heavy intermeshed metallic cables providing an openwork construction permitting the ready escape of explosion gases in all directions but serving to retain fragments caused by an explosion, the meeting edges of the walls being laced together and with the framework, whereby said meeting edges are as strong as the walls.

7. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, comprising an explosion chamber, completely enclosed, of open-mesh construction formed of heavy metallic intermeshed cables, the mesh permitting escape of the explosion gases in all directions but serving to retain fragments resulting from explosion, a door, also of open-mesh construction, means for locking the door against the force of the explosion and means for holding the explosive spaced from the floor and canopy.

8. A safety device for handling explosives, comprising an outer chamber, an inner chamber positioned inside the outer chamber, the walls of each of said chambers being of openwork construction and formed of heavy metallic intermeshed cables for allowing the escape of explosion gases and means in the inner chamber for holding the explosive spaced from the walls thereof.

9. A safety device for handling explosives, comprising an outer chamber, and an inner chamber positioned inside the outer chamber, the inner chamber being spaced from the walls and floor of the outer chamber, the walls of each of said chambers being formed of heavy metallic intermeshed cables for allowing the escape of explosion gases.

10. A safety device for handling explosives, comprising an outer chamber, and an inner chamber positioned inside the outer chamber, the inner chamber being substantially spherical and spaced from the walls and floor of the outer chamber, the walls of each of said chambers being formed of heavy metallic intermeshed cables for allowing the escape of explosion gases and means in the inner chamber for holding an explosive spaced from the walls thereof.

11. A safety device for handling explosives, comprising an outer chamber having a curved roof and a curved floor, and an inner chamber positioned inside the outer chamber and spaced from the roof and floor thereof, the roof and floor of the outer chamber and the walls of the inner chamber being of openwork construction and formed of heavy intermeshed metallic cables for permitting the ready escape of explosion gases

and means in the inner chamber for holding an explosive spaced from the walls thereof.

12. A safety device for handling explosives, comprising an outer chamber having a curved roof and a curved floor, and a substantially spherical inner chamber positioned inside the outer chamber and spaced from the roof and floor thereof, the roof and floor of the outer chamber and the walls of the inner chamber being of openwork construction and formed of heavy intermeshed metallic cables for permitting the ready escape of explosion gases and means in the inner chamber for holding an explosive spaced from the walls thereof.

13. A safety device for handling explosives, comprising an outer chamber having a curved roof and a curved floor, a door for providing access to the outer chamber, and an inner chamber composed of two hemispherical portions hinged together, means for locking said hemispherical portions closed, the walls and floor of the outer chamber and the walls of the inner chamber being of heavy metallic openwork construction for permitting the escape of explosion gases.

14. A safety device for handling explosives, comprising an outer chamber having a curved roof and a curved floor, a door for providing access to the outer chamber, an inner chamber composed of two hemispherical portions hinged together, means for locking said hemispherical portions closed, the walls and floor of the outer chamber and the walls of the inner chamber being of heavy metallic openwork construction for permitting the escape of explosion gases and means for positioning the inner chamber substantially centrally of the outer chamber, spaced from the roof and floor thereof.

15. A safety device for handling explosives, comprising an outer chamber having a curved roof and a curved floor, a door for providing access to the outer chamber, an inner chamber composed of two hemispherical portions hinged together, means for locking said hemispherical portions closed, the walls and floor of the outer chamber and the walls of the inner chamber being of heavy metallic openwork construction for permitting the escape of explosion gases and means for positioning the inner chamber substantially centrally of the outer chamber, spaced from the roof and floor thereof, the outer chamber comprising flattened frame members placed edge-wise with respect to explosion gases escaping from the inner chamber.

16. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, comprising a two-part, substantially spherical enclosure, formed of a suitable framework and a wall of heavy, intermeshed metallic cables, carried by said framework, the mesh formed by said cables allowing the escape of explosion gases but serving to retain fragments resulting from an explosion, and means within said enclosure for supporting the explosive spaced from the wall thereof.

17. A safety device for handling explosives generally, and particularly of the fragmentation type, such as infernal machines, comprising a two-part substantially spherical enclosure, formed of a suitable framework and a wall of heavy, intermeshed metallic cables, carried by said framework, the mesh formed by said cables allowing the escape of explosion gases but serving to retain fragments resulting from an explosion, the two parts of the framework being hinged to-

