

Aug. 7, 1962

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3,048,103

BLASTING ASSEMBLY

Filed Nov. 13, 1956

2 Sheets-Sheet 1

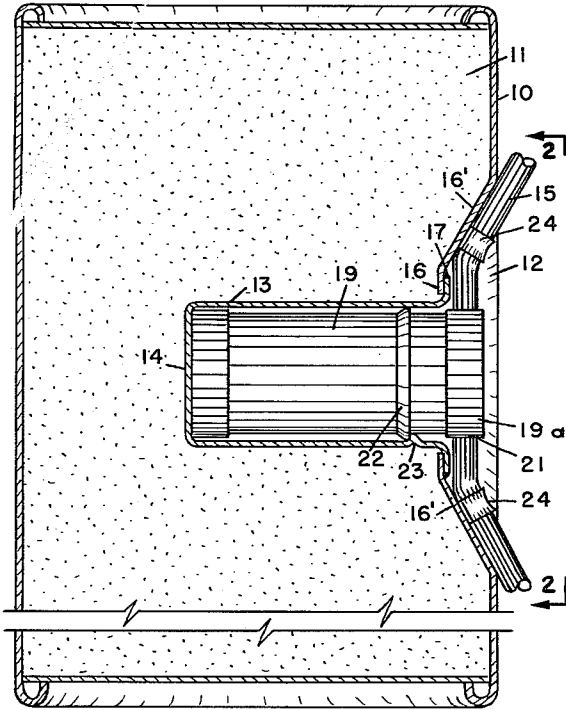


FIG. 1

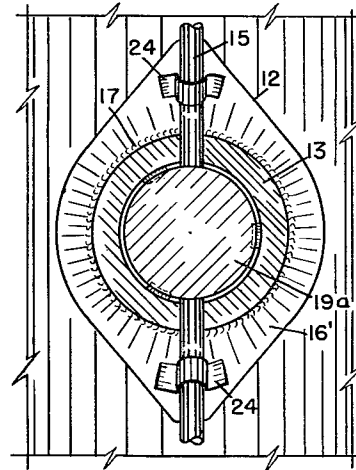


FIG. 2

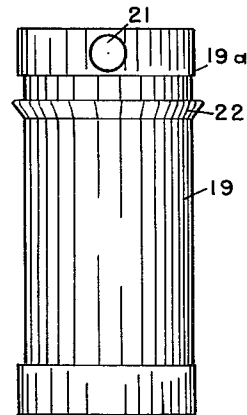


FIG. 3

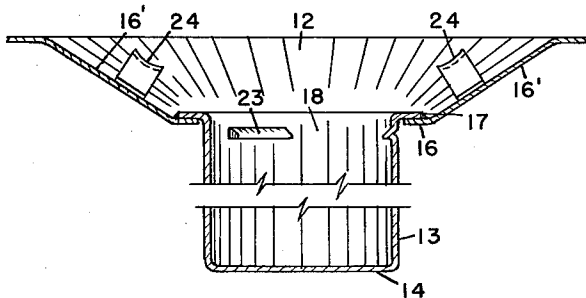


FIG. 4

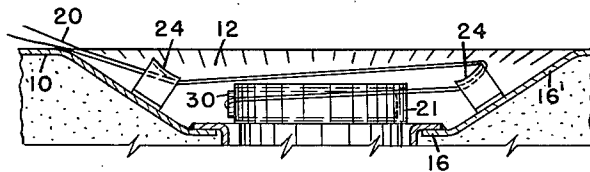


FIG. 5

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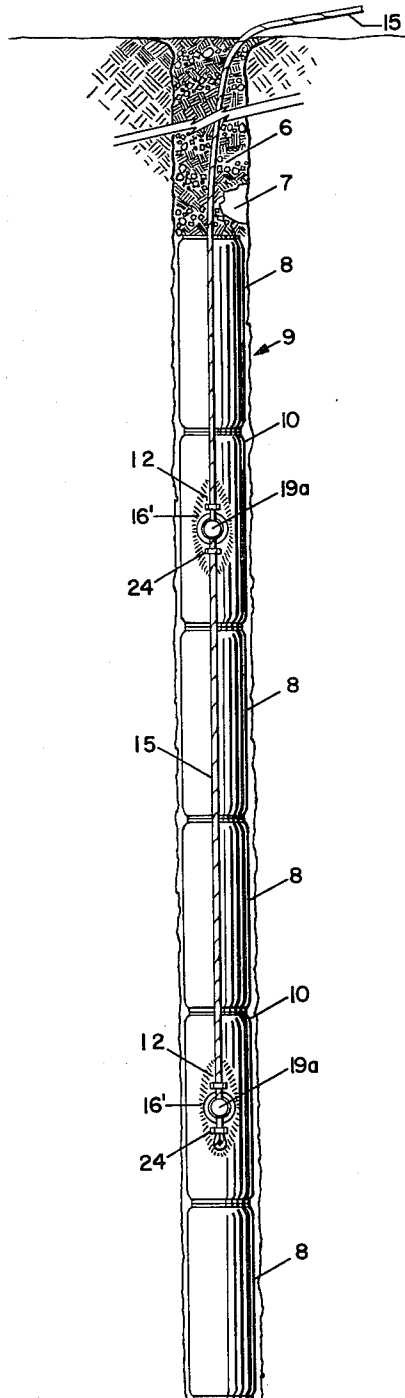


FIG. 6

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BLASTING ASSEMBLY

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Filed Nov. 13, 1956, Ser. No. 621,607

9 Claims. (Cl. 102-22)

This invention relates to new blasting assemblies. In one aspect this invention relates to new booster units. In another aspect this invention relates to primer units for use in an explosive column, particularly as applied to explosives of the nitrocarbonitrate type. In another aspect this invention relates to metal primer units in which a booster charge is supported in a booster well in indirect and propagating contact with a main explosive charge and is detonatable by a detonator maintained outside the well so that the detonator structure can extend along a plurality of such assemblies to operate and support the same as units of a column. In another aspect this invention relates to watertight metal primer cans containing means for supporting an initiator outside the can in propagating relationship with the booster charge, the initiator being protected from damage often incurred during operation in a borehole. In another aspect this invention relates to a new blasting method. In still another aspect this invention relates to a method for assembling a blasting assembly.

The use of an initiator or detonator in conjunction with a booster charge to detonate a relatively insensitive main explosive charge, i.e., insensitive to commercial blasting caps, has been practiced in the art for some time. Dynamites and nitrocarbonitrate compositions have been those relatively insensitive charges generally employed, a nitrocarbonitrate comprising mainly ammonium nitrate and some carbonaceous material with or without additional sensitizer.

In view of the hygroscopic nature of ammonium nitrate, it is important that it be kept dry at all times for use as an explosive. The art has therefore used watertight metal containers for such compositions. Various means have been employed for detonating such cap-insensitive charges. Often a column of such containers is employed in which is disposed one or more primer cans at predetermined points to effect the necessary detonation. The primer can contains a main cap-insensitive charge with a booster charge in propagating relationship therewith and an initiator or detonator in detonating relationship with the booster.

In accordance with one practice an elongated metal booster can assembly comprises a layer of main charge, a layer of booster charge superposed on the initially disposed layer and a top layer of main charge on the layer of booster or primer charge, and a detonating fuse led along the length and outside of the can and held against the can wall in detonating relationship with the layer of booster or primer charge in the can. Other primer cans of similar design have been employed. For example, a metal plate with protruding portions forming channels with the can has been utilized to hold a detonating fuse against the outside of the can. In all instances, the booster charge has been disposed as a layer and has been unduly voluminous in order to fill the requisite space for its support in the can. There has always been the potential danger of the layer settling out of detonating relationship with the detonating fuse with concomitant failure. Further, the packing of the booster or priming charge in the primer can has always involved an interruption of the packing procedure requiring thereby a separate step in the packing operation.

Primer can assemblies of the prior art in which the

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detonator element is held against the can side wall have been disadvantageous from the standpoint of utilization in a borehole inasmuch as the borehole diameter is only slightly greater than that of the can with the result that any assembly structure on the outside of the can wall is very likely to become lodged in the irregular borehole wall surfaces to "hang up" the assembly, so as to preclude contact with the remainder of the blast hole charge and impair blasting operations. In some instances the primer can containing the detonator on its outer wall as a unit of an explosive column has been made of a diameter smaller than that of the other can units in an effort to reduce the likelihood of a "hang up" of the can in the borehole. Even in such instances the problem of hang up of the assembly in the borehole has not been eliminated inasmuch as the detonator support assembly still protrudes from the outer wall of the can.

This invention is concerned with a primer can assembly adaptable as a unit of an explosive column in a borehole which utilizes a much smaller volume of booster charge than heretofore with use of a concomitantly larger amount of main charge, and with such an assembly which supports the detonator device in a manner that it does not protrude toward the borehole walls and is protected therefrom, whereby hang up in the hole due to the position of the detonator support means is substantially eliminated and the primer can assembly of an explosive column need not be limited to one of diameter smaller than that of other can units joined therewith.

An object of this invention is to provide an explosive assembly. Another object is to provide for use of a markedly reduced volume of booster charge in a primer can assembly, with a concomitant increase in the amount of main charge. Another object is to provide a primer can assembly for use as a unit in a cap-insensitive explosive column. Another object is to provide an explosive column containing such a primer can as a unit. Another object is to provide improved booster units. Another object is to provide a primer can assembly with an initiator protected from damage often incurred when operated in a borehole. Another object is to provide a method for manufacture of primer can assemblies. Another object is to provide a primer can assembly adapted to support a smaller volume of booster charge than used heretofore. Another object is to provide a method for assembling a blasting assembly. Another object is to provide a blasting method. Other objects and aspects will be apparent in light of the accompanying disclosure and the appended claims.

In accordance with this invention an assembly for blasting is provided which comprises a rigid container; a tube extending with closed end into said container from a side wall thereof and in direct communication at an open end with the outside of said container through said side wall; and a booster charge as a unitary solid body in said tube adapted to be in propagating relationship with a detonator when said detonator is disposed outside said container and said tube. Also in accordance with this invention a booster device is provided which comprises an explosive composition detonatable by a commercial blasting cap disposed as a unitary solid body; means associated with the said body for securing it in a tube closed at one end; and means associated with said body for supporting a detonator across one end portion of said body in direct propagating relationship with said end portion. Further in accordance with our invention, a blasting method is provided in which is employed as the explosive assembly an elongated body of a main explosive charge with a recess in a side wall thereof; a solid unitary booster body extending through at least a portion of said recess into indirect contact and propagating relation with the said main charge; and an opening in a portion of said booster charge in said recess

together with a detonating fuse extending longitudinally along the outside of the said main charge in indirect contact therewith and through said recess and said opening in propagating relation with the said booster. Still in accordance with the invention is provided a method for assembling a blasting assembly which comprises packing a container having a recess in a side wall and a well extending from said recess into said container, with an explosive charge; inserting a solid unitary booster body into said well; and retaining an outside end portion of said booster in said recess and adapting said end portion for securing a detonating cord thereto.

Our invention is illustrated with reference to the attached drawings of which: FIG. 1 illustrates a now preferred primer can assembly with booster charge in a well in a side wall of the can and a detonating fuse outside the primer can, extended through a portion of the booster, the detonating fuse booster assembly being protected from damage ordinarily incurred when operated in a borehole; FIG. 2 is a side view of an assembly such as illustrated by FIG. 1, more clearly illustrating structure for supporting a booster charge together with detonating fuse in a recess or draw of a primer can assembly of this invention; FIG. 3 is a perspective view of a booster charge unit of this invention with an opening in an end portion for accepting a detonating fuse and with a lock ring for securing the booster unit in a booster well assembly; FIG. 4 illustrates a recess or draw made in the wall of the primer can of FIG. 1 together with clamp means for supporting the detonating fuse against the wall of the draw and a lug on the well inner wall for engaging the ring assembly of FIG. 3 to lock the booster in the well; FIG. 5 illustrates use of an electric blasting cap as a detonator in lieu of detonating fuse in the assembly of FIG. 1; and FIG. 6 illustrates an assembly of the invention disposed with other units to form an explosive column in a borehole. FIGURES 2, 3, and 4 each illustrate structure of FIG. 1 in somewhat more detail.

With reference to FIG. 1, container 10 is preferably elongated, cylindrical, and watertight and contains an explosive charge 11 such as a dynamite or a cap-insensitive ammonium nitrate, i.e., a nitrocarbonitrate. Container 10 is generally formed from a metal of about 26 to 30 gage, although, if desired, nonmetallic materials can be employed in the fabrication of container 10 so long as the said material is rigid and provides necessary strength required for utilization of the assembly in a borehole. Thus, if desired, container 10 is fabricated of any suitable plastic material as for example Bakelite (phenol-formaldehyde resin), polyethylene, polystyrene, cellulose acetate, poly(vinyl chloride), and the like.

Container 10 is deep drawn on a side wall to form draw or recess 12, also illustrated with reference to FIGURES 2 and 4. Draw 12 is of depth sufficient to contain a detonator, preferably a detonating fuse 15, within its confines, i.e., so that the detonating fuse 15 is protected at its juncture with a booster charge described hereafter from objects in the borehole with which it would come in contact if it were disposed along the main side wall of container 10. Tube or booster well 13 extends into container 10, closed end first, through that side wall portion of container 10 which constitutes innermost wall 16 of draw 12 and in contact with explosive material 11 in container 10. Tube 13 is sealed with wall 16 by solder or seam weld 17 (see FIG. 2) to thereby maintain container 10 watertight. Tube or well 13 is sealed with wall 16 with open end 18 in direct communication with the outside of container 10 and terminating within the outer confines of draw 12, such as about flush with wall 16.

Booster 19 is a unitary solid body of any suitable booster composition such as a polymeric material containing a suitable crystalline explosive dispersed throughout. Such an explosive material is disclosed and claimed in the copending application of Alpheus M. Ball, Serial No. 538,788, filed October 5, 1955, now abandoned.

Booster 19 is shaped so that it can be inserted in well 13 and is so disposed in well 13 that end portion 19a extends from tube 13 into draw 12 within the outer confines of draw 12.

As shown with reference to FIG. 3, an opening 21 is formed across end portion 19a and is of size adapted to accept detonating fuse 15. Booster 19 is disposed in well 13 with end portion 19a disposed so that its axis is in a plane preferably substantially perpendicular to a plane containing the longitudinal axis of booster 19. Detonating fuse 15 (see FIGURES 1 and 2) extends along walls 16' of draw 12 and wall 16 through opening 21 of booster 19. Detonating cord 15 extends above and/or below draw 12 as desired, preferably along the side wall of container 10, and from container 10 to any suitable point at which it is to be detonated as by a blasting cap. When the assembly of FIG. 1 is disposed with other units to form a column, the detonating fuse is advantageously extended along the side wall of all units to afford maximum protection against damage otherwise incurred from contact with foreign objects in the borehole. It is to be understood, of course, that an explosive column can contain a plurality of primer can assemblies of FIG. 1, dependent upon the total number of units desired. By way of illustration with reference to FIG. 6, a suitable explosive column 9, in borehole 7, stemmed with stemming material 6 can consist of successively one can of nitrocarbonitrate 8, a primer can assembly of FIG. 1 (like numbers represent like parts), from two to four cans of nitrocarbonitrate and another primer can assembly, and preferably, another can of nitrocarbonitrate 8. In such a column, as illustrated, detonating fuse 15 is preferably extended from the booster unit in the bottommost primer can upwardly along the side walls of the nitrocarbonitrate units, through the booster charge in the topmost primer can, and along the uppermost nitrocarbonitrate container to the point at which it is to be detonated.

As shown in somewhat more detail with reference to FIG. 3, rim 22 is disposed as a part of unit 19 about the circumference of the said unit, and although it serves to bush booster 19 in well 13, it more importantly serves in combination with lugs 23 on the inner wall of well 13 to lock the booster in the well. Thus lugs 23 are advantageously spaced equally, e.g., three lugs about 120° apart, and are preferably formed by indentations in the side of the well and toward the center, by force applied so that the resulting indent is depressable by force applied in a direction toward closed end 14 of unit 19 but rigid against force when applied in the opposite direction. Lugs 23 are directly above rim 22 and extend onto the top of rim 22 to thereby lock unit 19 in place. Alternatively, one or more individual rims on booster 19 can be employed in lieu of lock ring 22, it being important in any event that a lug on the inner wall of well 13 is available for engaging such a rim to lock the booster in the well.

Other suitable locking means may be employed as desired, it being important that booster unit 19 is provided with means for engaging lugs or other suitable locking means in well 13 to secure booster 19 in the well.

The assembly of FIG. 1 is further provided with suitable support means for securing detonating fuse 15 against an outside wall of container 10 in draw 12, i.e., one or both of walls 16'. One such means illustrated is a plurality of clamps 24 attached to the outside wall of container 10 within the draw and adapted to grip the detonating fuse so as to hold it against the walls 16'. The clamp or gripping means 24 is preferably itself within the draw 12 so as to minimize possibility of its contact with foreign objects in the borehole. Clamps 24, in addition to providing direct support to the fuse so as to protect the fuse booster juncture from force or tension during handling of the assembly, particularly when the unit is employed as part of an explosive column, serve as guides for the detonating cord.

Although we prefer that the detonator 15 be a detonating fuse 15, a blasting cap can be employed if desired as illustrated with reference to FIG. 5. Thus, a blasting cap 30 is secured within the opening 21 of unit 19 by wrapping lead wires 20 about and below said opening and extending the lead wires 20 upwardly along the side wall of container 10.

Any suitable booster composition can be employed so long as it can be secured as a unitary solid body in a booster well and in propagating relation with a detonator in accordance with this invention. Exemplary of suitable boosters are tetryl, pentaerythritol tetranitrate, picric acid, cap sensitive dynamites, and the like. These materials are generally packaged in a suitable wrapper for adaptation in the blasting assembly as described herein, although various type paper wrappers can be employed; a plastic wrapper is particularly suitable in view of the increased strength that it imparts to the booster composition, together with an improved resistance to water over longer periods.

Booster compositions advantageously employed are those produced by the formation of the polymerization product of a uniform mixture of polymerizable vinyl material through which is dispersed a nonaromatic explosive material selected from the group consisting of azides, organic nitrates and organic nitramines. Such vinyl-type polymerizable materials are exemplified by the acrylics such as methyl, ethyl and butyl acrylate or methacrylate; styrene, styrene-polyesters, acrylonitrile, diallyl phthalate and the like. The acrylics and the styrene-polyesters are preferred. Exemplary nonaromatic explosive components are ethylene dinitramine, methylene dinitramine, cyclotrimethylenetrinitramine, diethanolnitramine dinitrate, pentaerythritol tetranitrate, lead azide, silver azide, nitrolactose, succrose octanitrate, lactose octanitrate and mannitol hexanitrate. Nitrocellulose in fibrous or filament form or in solution may also be employed. When it is desired to incorporate a liquid explosive in the composition, nitroglycerin or other liquid nitric ester may be employed. These compositions are set forth in application Serial No. 538,788, above referred to. Our preferred booster charge is a polymerization product of the type described above containing pentaerythritol tetranitrate as the dispersed explosive component, polybutylmethacrylate-PETN being now preferred.

The size of the booster body is small as compared with the size of the main charge. Booster bodies of this invention, by way of example, are often from 1/2" by 2" up to about 2 1/2" by 4", these dimensions being particularly characteristic of those booster units containing as the explosive composition a polymerization product containing the explosive component dispersed therethrough.

An important feature of the invention is the single-step packing operation that can be employed in loading the blasting assembly. In loading the prior art devices, the packing step must be interrupted to permit loading the booster layer and then be resumed to complete the charge. Thus, it is, in accordance with this invention, only necessary to completely charge the container, with well and draw in place, and subsequently insert the booster unit into the well, the detonating fuse being generally inserted just prior to firing the charge. This improvement is of major importance, particularly with reference to assembly line packing where considerable time has been consumed in the past in terminating the packing operation, moving the container to a position for packing a layer of booster charge in position for detonation by the initiator, packing the booster charge, and then moving the container from the booster charging step to a position for completing charge of the main explosive. Thus, in accordance with our invention, we can pack the container with one composition rather than using various increments in the cans such as is necessary in packing the primer cans of the prior art.

The container, preferably a metal container, is of any

suitable size, say from 3 inches to 11 inches in diameter and of length in the order of from about 10 to 24 inches. Metal containers of size outside these ranges can, of course, be employed.

Although any cap-insensitive main explosive charge is preferably employed in the practice of this invention, the invention is not limited thereby, as any type of main explosive charge can be employed as desired.

Nitrocarbonitrate explosive compositions which constitute our now preferred main charge are sufficiently insensitive so that they will consistently fail, when unconfined, to propagate when initiated by the strongest commercial detonator in general use, namely, a No. 8 cap. Thus, the sensitivity of the composition is far below that necessary to detonate consistently with a single commercial blasting cap of maximum strength.

The No. 8 blasting cap is defined as one containing the standard charge of 2 grams of mercury fulminate or fulminate composition and the No. 6 cap is defined as one containing 1 gram of mercury fulminate or fulminate composition, both as set forth in Bulletin No. 39 of the U.S. Bureau of Mines.

The nitrocarbonitrate is not, however, less sensitive than a uniform composition comprising 94.5 percent ammonium nitrate and 5.5 percent paraffin, providing the ammonium nitrate has a certain fineness and the finished explosive has a density not exceeding 1.15.

Sensitivity of nitrocarbonitrate explosives can be regulated by utilizing a more efficient sensitizer such as a nitroaromatic compound or mixture thereof, preferably one or more of the nitrotoluenes. Preferably, a fuel is utilized with the nitrocompound which is capable of utilizing the excess oxygen of the ammonium nitrate with generation of heat. Hydrocarbons of the olefin, paraffin or aromatic series, paraffin, and carbon as coal, are advantageously employed, although many other suitable carbonaceous materials have been utilized, such as amyl alcohol, ethylene glycol, starch, cellulose and the like.

Exemplary of other sensitizers that can be employed are Mg, Al, Se, S, inorganic sulfides and carbides.

A satisfactory nitrocarbonitrate composition is one containing, for example, 92-95 percent ammonium nitrate and 5-8 parts of coal. When employing a nitroaromatic hydrocarbon as a sensitizer, from about 0.5 to 10 percent of each nitrocompound is employed, the composition preferably containing about 85 percent or more ammonium nitrate. If less than 85 percent ammonium nitrate is employed, other explosive compounds may be used to make up the deficiency, such as perchlorates as $KClO_3$, or another nitrate as $NaNO_3$. However, in any event, the amount of sensitizer or supplementary explosive employed is limited to that which will not place the explosive outside the prescribed sensitivity limits, i.e., to render the composition detonatable by a commercial blasting cap.

Exemplary nitrocarbonitrate compositions are as follows:

Composition-----	1	2	3 ¹	4	5
	Weight Percent				
Ammonium Nitrate-----	92	91.3	91	70	94
Sodium Nitrate-----				20	
Dinitrotoluene-----	4		5		
Nitrobenzene-----		6.5		6.5	
Paraffin-----	4			3.5	
Fuel Oil-----		2.2			
Coal-----			4		6

¹ A now preferred composition.

Any suitable means, associated with the solid booster unit for locking it in the booster well and securing a detonator to an end portion extending from the well, can be employed, the specific structure disclosed therefor being illustrative of a now preferred embodiment.

Although we prefer a draw or recess structure in a side wall of the container, e.g., draw 12 of FIG. 1, the said draw can be dispensed with in the event that the assembly is to be employed in a borehole substantially free from foreign objects which might otherwise interfere with and damage the detonator-booster juncture. The invention provides, even in absence of draw or recess structure described, for disposing a primer can assembly in an explosive column, i.e., as a unit thereof, without there being danger from cutting action of an adjacent unit on the detonating fuse cord or the leads of an electric blasting cap as the case may be, which would be inherent in the event that the booster assembly of the detonator were disposed in the top or bottom of the booster can.

As will be evident to those skilled in the art, various modifications can be made or followed, in the light of the foregoing disclosure and discussion, without departing from the spirit or scope of the disclosure or from the scope of the claims.

What we claim and desire to protect by Letters Patent is:

1. A blasting assembly comprising an elongated water-tight blasting cartridge, and a side wall portion of said cartridge recessed toward the interior thereof; a detonatable explosive, as the sole explosive charge, within said cartridge insensitive to detonating action of a commercial blasting cap but sensitive to detonating action of a booster charge; as a booster well, a conduit closed at one end and open at the other end and extending, closed end first, from within said recess through the said recessed wall portion, into said main charge, and terminating therein; said booster well being adapted to contain a booster charge secured therein as a solid unitary body, in detonating relation with said main charge; and means for securing a detonator in spaced position from the open end of said well, and within the recess formed by said recessed wall portion.

2. A blasting assembly comprising an elongated water-tight blasting cartridge, and a side wall portion of said cartridge recessed toward the interior thereof; a detonatable explosive, as the sole explosive charge, within said cartridge, insensitive to detonating action of a commercial blasting cap but sensitive to detonating action of a booster charge; as a booster well, a conduit closed at one end and open at the other end and extending, closed end first, from within said recess through said recessed wall portion into said main charge, and terminating therein; a booster charge, as a unitary solid body, in said well in detonating relationship with said main charge and extending therefrom into the recess formed by said recessed wall portion; said booster well containing said unitary booster body secured in position in said well as described; and means for securing a detonator within said recess in contact with the end of said booster body therein, to thereby be in detonating relationship with said booster.

3. A blasting assembly comprising an elongated water-tight metal blasting cartridge, and a side wall portion of said cartridge recessed toward the interior thereof so as to form a resulting elongated recess extending in a direction substantially parallel with that of the longitudinal axis of said cartridge; a detonatable explosive, as the sole explosive charge, in said cartridge, insensitive to detonating action of a commercial blasting cap but sensitive to detonating action of a booster charge; as a booster well, a conduit closed at one end and open at the other end and extending, closed end first, from within said recess through said recessed wall portion into said main charge, and terminating therein; a solid body of plastic containing a high explosive dispersed therein, as a booster charge, secured in said well in detonating relation with said main charge and extending from said well into the recess formed by said recessed wall portion and terminating therein; the end portion of said solid

booster, within said recess, containing a passageway extending through and across same in a direction substantially parallel with that of the longitudinal axis of said cartridge; a detonating cord extending along the exterior of said cartridge, in a direction substantially parallel with that of the longitudinal axis of said cartridge, into said recess and through the said passageway therein; and fastening means within said recess for securing said detonating cord against the recessed wall portion of said cartridge, thereby also serving to secure said cord in said passageway as means for securing said plastic booster charge in said booster well.

4. In an assembly of claim 3 a rim affixed to at least a portion of said booster body in said well, a lug on an inner wall of said well disposed above said rim engaged with said rim to lock said booster body in said well.

5. In an assembly of claim 3, at least one clamp affixed to said container within said recess and adapted to engage said detonating cord to support same within said recess, as said fastening means.

6. In an assembly of claim 3, a flange at the open end of said conduit, and said flange being sealed to the recessed wall in directly aligned open communication with the deepest portion of said recess.

7. A blasting assembly, comprising an elongated metal water-tight blasting cartridge, and a side wall portion of said cartridge recessed toward the interior thereof; a detonatable explosive, as the sole explosive charge, within said cartridge, insensitive to detonating action of a commercial blasting cap but sensitive to detonating action of a booster charge; as a booster well, a conduit closed at one end and open at the other end and extending, closed end first, from within said recess through said recessed wall portion into said main charge, and terminating therein; a booster charge, as a unitary solid body, in said well in detonating relationship with said main charge and extending therefrom into the recess formed by said recessed wall portion; a rim affixed to at least a portion of said booster body and a lug on an inner wall of said well intermediate said rim and the open end of said well and engaged with said rim to lock said booster body in said well; and means for supporting a detonator within said recess in contact with the end of said booster body therein, to thereby be in detonating relationship with said booster.

8. A blasting assembly comprising an elongated water-tight metal blasting cartridge, and a side wall portion of said cartridge recessed toward the interior thereof so as to form a resulting elongated recess extending in a direction substantially parallel with that of the longitudinal axis of said cartridge; a detonatable explosive, as the sole explosive charge, in said cartridge, insensitive to detonating action of a commercial blasting cap but sensitive to detonating action of a booster charge; as a booster well, a conduit closed at one end and open at the other end and extending, closed end first, from within said recess through said recessed wall portion into said main charge, and terminating therein; a solid body of plastic containing a high explosive dispersed therein, as a booster charge, in said well in detonating relation with said main charge and extending from said well into the recess formed by said recessed wall portion and terminating therein; means for locking said booster charge in said well when positioned therein as described, the end portion of said booster within said recess, containing a passageway extending through and across same in a direction substantially parallel with that of the longitudinal axis of said cartridge; an electric blasting cap within said recess and the said passageway therein, and lead wires to said blasting cap extending along the exterior of said cartridge in a direction substantially parallel with that of the longitudinal axis of said cartridge; and fastening means within said recess for securing said lead wires against the recessed wall portion of said cartridge.

9. An explosive assembly comprising a plurality of elongated metal water-tight blasting cartridges in alignment with one another to form a blasting column; a detonatable explosive, as the sole explosive charge, within each said cartridge, insensitive to detonating action of a commercial blasting cap but sensitive to detonating action of a booster charge; at least one of the said cartridges forming said column constituting a primer cartridge and containing a wall portion recessed toward the interior thereof so as to form a resulting elongated recess extending in a direction substantially parallel with that of the longitudinal axis of the said primer cartridge; a booster well extending through the recessed wall portion of said primer cartridge into said main charge; a solid body of plastic containing a high explosive dispersed therein, as a booster charge, secured in said well in detonating relation with said main charge and extending from said well into the recess formed by said recessed wall portion, and terminating in said recess; the end portion of the said plastic booster body, within said recess, containing a passageway extending through and across same in a direction substantially parallel with that of the longitudinal axis of said primer cartridge; a detonating cord extending along the exterior of said cartridge from the top of said column into said recess and

through the said passageway therein; and fastening means within said recess for securing said detonating cord against the recessed wall portion of said primer cartridge, thereby also serving to secure said cord in said passageway as means for securing said plastic booster charge in said booster well.

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