Sept. 1, 1953 K. C. BUGG 2,650,540

BLASTING CARTRIDGE

Filed Feb. 7, 1950 2 Sheets-Sheet 1

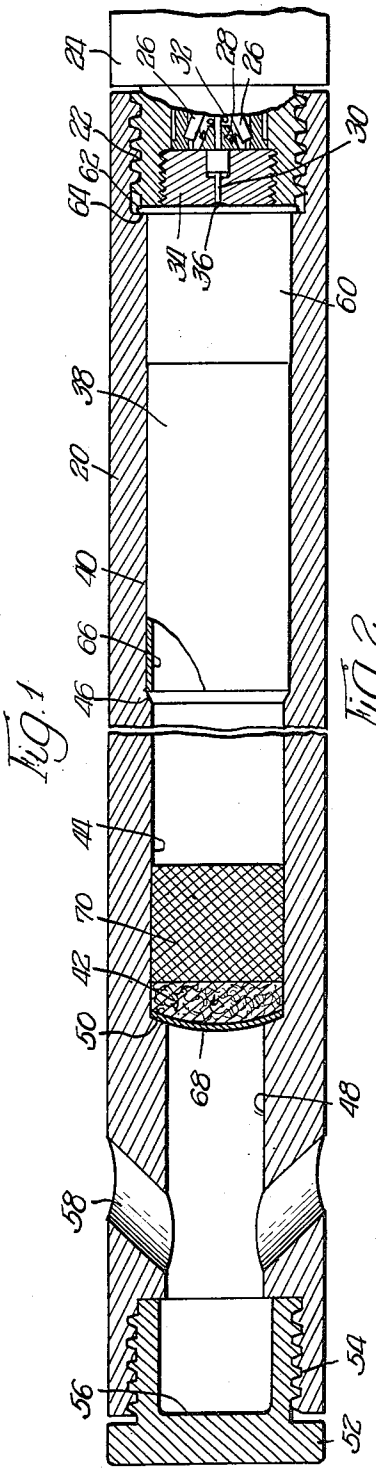


Fig. 1

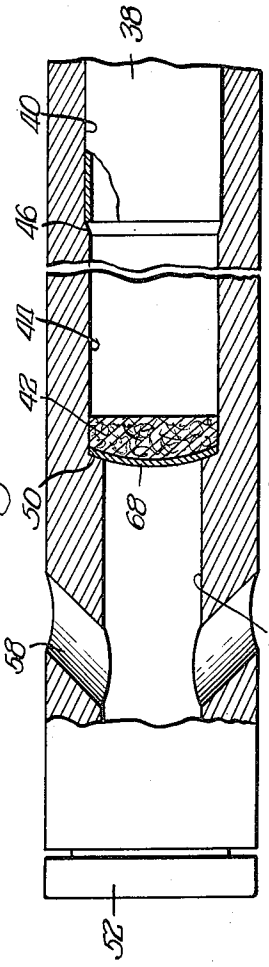


Fig. 2

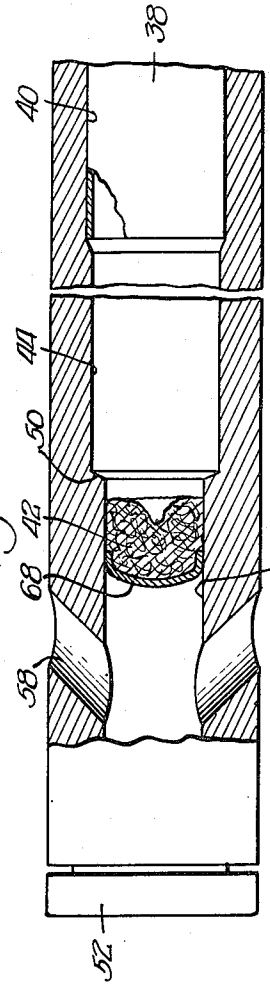


Fig. 3

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BLASTING CARTRIDGE

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Fig. 1

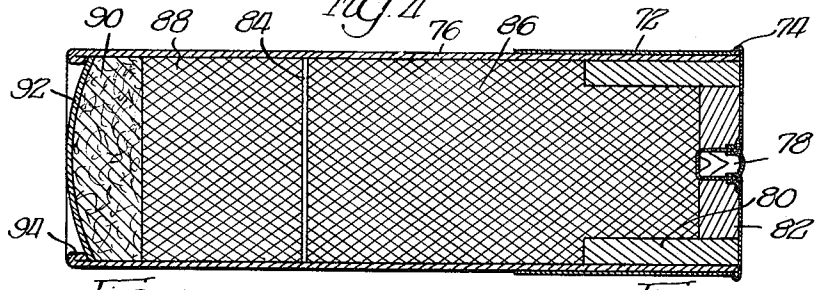


Fig. 5

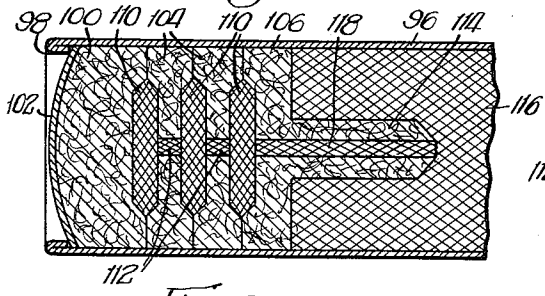


Fig. 6

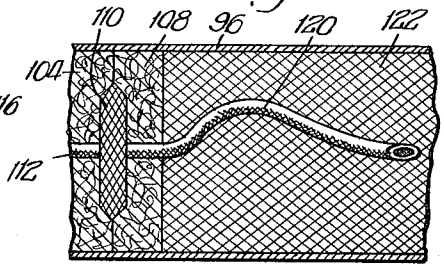


Fig. 7

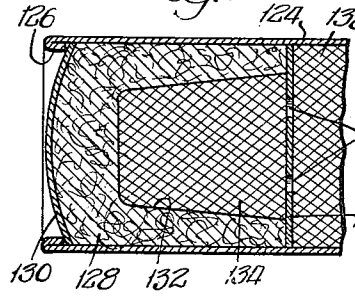


Fig. 8

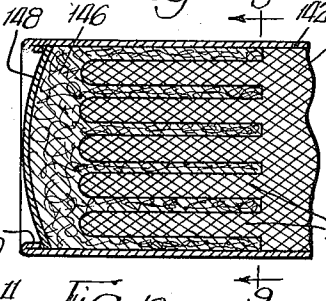


Fig. 9

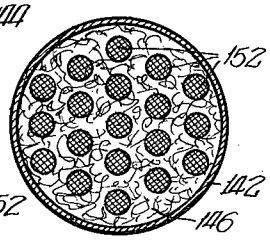


Fig. 10

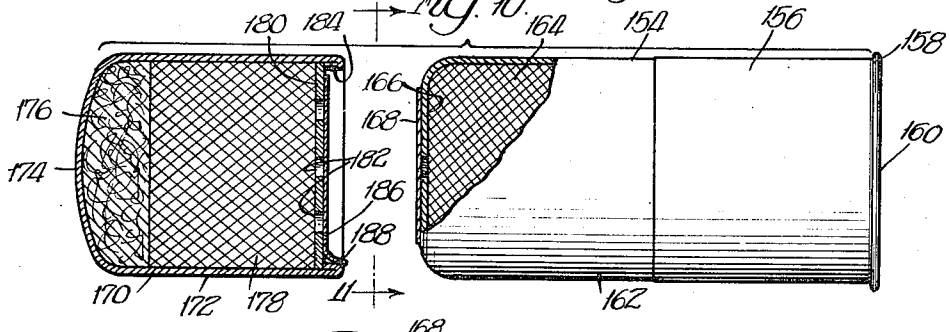
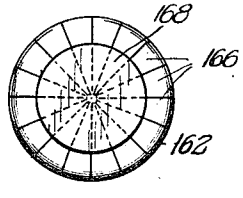


Fig. 11



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BLASTING CARTRIDGE

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Application February 7, 1950, Serial No. 142,777

8 Claims. (Cl. 102—25)

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This invention pertains to a blasting cartridge and, more particularly, to a cartridge for a blasting shell which is so constructed that it has a timing effect.

An object of the invention is to provide a pressure building cartridge wherein means are provided to give a longer timing effect for discharge of the working pressure.

Another object of the invention is to provide a pressure building cartridge operable to release and cause the wadding or projected (propelled) end thereof to operate during a predetermined timing cycle, and wherein the shell is adapted particularly for use with a blasting shell wherein the discharge ports communicate with a passage which is choked (or tapered), or with a passage which communicates with a passage which has been choked prior to the communication between the discharge ports and the passage thereto.

Another object of the invention is to provide a pressure building cartridge wherein the wadding, when it is moved to the choked position, is reduced in mass and/or deflagrated to release the pressure built up behind the wadding to the discharge ports.

Another object of the invention is to provide pressure holding means as for a blasting cartridge that performs a timing function, upon reduction of its mass by oxidation, so that the discharge of the blasting shell may be controlled for the full pressure build up of said cartridge in the blasting shell.

Another object of the invention is to provide a cartridge for a blasting shell or the like, and a pressure timing means separate thereto wherein greater volume of charges can be obtained without necessitating complicated cartridge assembly.

Another object of the invention is to provide a pressure building cartridge for a blasting shell or the like, provided with means of timing the developed pressures thereof, and wherein the cartridge can be readily manufactured in a manner similar to present pressure cartridge manufacture.

Another object of the invention is to provide a pressure building cartridge for a blasting shell or the like, wherein after firing, the resultant pressure and timing may be exactly controlled in regard to the pressure release from the blasting shell wherein the cartridge is used.

Another object of the invention is to provide a pressure building cartridge for a blasting shell and the like, and time control therefor, which is constructed and arranged for the greatest possible safety of handling and loading with respect to the blasting shell wherein it is used.

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Another object of the invention is to provide a pressure building cartridge wherein parts can be made so that the generated pressures can be selectively varied by association of parts of various capacities.

With these and various other objects in view, the invention consists of certain novel features of construction and operation as will be more fully described and particularly pointed out in the specification, drawings and claims appended hereto.

In the drawings, which illustrate embodiments of the device and wherein like reference characters are used to designate like parts—

Figure 1 is a fragmentary, sectional elevation through a form of blasting shell device embodying the invention, showing a blasting cartridge embodying the invention in position wherein the cartridge has been fired but the powder or oxidizable pressure generating means is still burning;

Figure 2 is a fragmentary, sectional elevation corresponding to Figure 1, but showing the wadding as in position as illustrated in Figure 1 after the powder has been burned but prior to the movement of the wadding by the pressure generated;

Figure 3 is a fragmentary, sectional elevation corresponding to Figure 2 showing the wadding in position after a pressure increase and just prior to the wadding uncovering the pressure release ports;

Figure 4 is an enlarged, sectional elevation through a form of blasting cartridge embodying the invention;

Figures 5 to 8, inclusive, are fragmentary, sectional elevations through portions of modified forms of blasting shells embodying the invention;

Figure 9 is a sectional plan view taken substantially in the plane as indicated by the line 9—9 of Figure 8;

Figure 10 is an exploded view of another modified form of blasting cartridge embodying the invention; and

Figure 11 is an end elevation of the sealed end of the portion of the blasting cartridge at the right of Figure 10, the same looking in the direction of the arrows 11—11 in Figure 10.

Referring first of all, more particularly, to the blasting shell device illustrated in Figures 1 to 3, inclusive, it is of course understood that a shell device such as illustrated in applications, Serial No. 136,769, filed January 4, 1950, and Serial No. 142,512, filed February 4, 1950, now Patent No. 2,625,104, may be utilized, but for the purpose of this application, the shell device comprises the

substantially cylindrical body member 20 threaded as at 22 for the reception of mating threads of the firing mechanism casing 24, said firing mechanism being particularly shown and described in application Serial No. 136,769, filed January 4, 1950. The firing mechanism is operated as described in said last named application, suitable operating means releasing pivoted latch members 26 after a predetermined movement thereof toward the right as viewed in Figure 1. Movement of the latch members 26 toward the right serves to move the hammer 28 away from firing pin 30, such movement of hammer 28 compressing spring 32 whereupon, upon release of latches 26, spring 32 moves hammer 28 to strike pin 30 causing it to move toward the left in closure 34 of casing 24. Pin 30 is adapted to contact detonating means shown generally at 36 in the firing cartridge 38, such cartridge being received in the cylindrical cartridge recess 40 in body member 20 of the shell device. Firing the cartridge 38 causes the oxidizable pressure generating means to be burned, projecting the wadding 42 causing it to move in the substantially cylindrical cavity, chamber or passage 44, which may be termed a choke or constricting passage, being of slightly smaller diameter than recess 40, being connected thereto as by the frustoconical shoulder 46.

Passage 44 communicates with the substantially cylindrical outlet passage 48, which is of smaller diameter than choke passage 44, being connected to said choke passage as through shoulders 50. Passage 48 is adapted to be closed at its forward end by means of the end closure member 52 threaded to the body member as at 54, the end closure member being provided with the recess 56.

For the purpose of convenience the end of housing 20 provided with threads 22 for connection to the firing mechanism casing 24 is herein termed the rear end of the device, while the end of the device provided with the threaded connection 54 is termed the forward end. All threads are preferably of the quick disconnect type, and recess 40, passages 44 and 48, and the cavity 56 are co-axial.

Passage 48 is provided with the rearwardly directed pressure releasing passages or ports 58, which are generally radially disposed from passage 48, and are controlled to release pressure generated by the firing of cartridge 38 (and the cartridges described with respect to Figs. 4 to 11, inclusive), by the passage of the wadding past ports 58.

Referring generally to the cartridge 38 illustrated in Figures 1 to 3, inclusive, said cartridge 38 comprises the shell casing 60 which is of non-corrosive material, such as brass, plastic, etc., said casing having an end closure positioning flange 62 for engagement with the shoulder 64 disposed at the rear end of body member 20 (or rear end of recess 40) whereby the flange may be clamped between the forward end of firing mechanism casing 24 and said shoulder 64. Detonating means, generally indicated at 36, extends within the cartridge, and the cylindrical charge retaining sleeve 66 is provided in shell casing 60 projecting therefrom.

Sleeve 66 from the end closure of casing 60 is filled with a pressure charge such as a self-oxidizing nitrate, and the end of sleeve 66 is flanged for retaining wadding 42, the wadding being protected by means of a wadding nose 68, preferably of waterproof material. The wadding is provided with a slow burning oxidizing means 70 which is preferably adhered to the wadding and separated from the first named self-oxidizing means as by a fast burning powder or igniter, more particularly described with respect to Figure 4.

Thus, generally, in operation of the device illustrated in Figures 1 to 3, inclusive, operation of the firing mechanism of casing 24 in the manner described in said application Serial No. 136,769 causes operation of the detonating cap 36, which operates to ignite the pressure charge adjacent said detonating cap and within sleeve 66. Oxidation of said pressure charge causes operation of the fast burning igniter and oxidation of charge 70. As the pressure charges burn, pressure is built up, causing wadding 42, nose 68 and charge 70 to be moved toward the left as viewed in Figure 1 within choke passage 44, slightly constricting wadding 42, nose 68 and charge 70. Wadding 42, nose 68 and charge 70 will be arrested momentarily, by shoulder 50 as illustrated in Figures 1 and 2, and charge 70 will burn or oxidize. This oxidation increases the pressure and expansion takes place between the wadding 42 (Figure 2) and shell casing 60. After a predetermined time interval, the pressure will have built up sufficiently to cause the wadding 42 and nose 68 to be extruded and moved along passage 48 until it passes ports 58, permitting the pressure to be released rearwardly through said ports to react against the adjacent material (such as coal, etc.) to move said material in the desired manner, all as particularly described in said application Serial No. 136,769.

Figures 4 to 11, inclusive, illustrate different modified forms of cartridges for accomplishing the above referred to objects, the different forms of cartridges being selected for various reasons, such as a different timing effect, a different cost, different handling problems, different storage problems, etc.

In the cartridge illustrated in Figure 4, said cartridge comprises the shell casing 72 of non-corrosive material, such as brass, plastic, etc., having the flanged end closure 74. A charge retaining sleeve 76 is secured within the casing 72 and projects from the end closure outwardly of the open end of the casing, said sleeve being preferably of water-proof material such as cardboard or the like, the inner end of said sleeve shown abutting the end closure 74. End closure 74 is provided with the detonating cap 78 extending inwardly thereof, and being adapted to be operated as by the firing pin 30 in Figure 1. Cardboard positioning liners 80 and 82 (of circular cylindrical and circular disk shape, respectively) are disposed within the shell casing 72, and sleeve 76, and between said liners and an igniter 84 there is disposed a pressure charge 86, such as a self-oxidizing nitrate, the igniter comprising a fast burning powder which is preferably adhered to a charge 88 of slow burning powder, which is preferably at least as slow burning as the charge 86. By adhering the igniter 84 to the charge 88, the thorough ignition of charge 88 is insured.

Wadding 90 is disposed within the sleeve 76 outwardly of charge 88 and the wadding is protected by means of a nose 92 preferably of water-proof material, such as cardboard, the wadding and nose being retained by the crimped or flanged end 94 of sleeve 76. In this form of the device, therefore, operation of the detonating cap 78 oxidizes charge 86, in turn causes ignition of igniter 84, the pressure built up projecting the wadding 90, nose 92 and charge 88 outwardly

of sleeve 76, such as shown at 68—42—70 of Figure 1. Igniter 84 and charge 88 are then burned until pressure is built up sufficiently to move nose 92 and wadding 90 from the position as shown at 68—42 in Figure 2, to uncover the pressure releasing ports 58 as described with respect to 68—42 in Figure 3.

In the devices illustrated in Figures 5 and 6, charge retaining sleeves 96 are similar to sleeves 76 and are closed by means of a flanged end member, not shown, similar to member 74 (Figure 4). Sleeves 96 are flanged as at 98 (similar to 94 in Figure 4) for retaining the end wadding members 100 and nose 102, similar to wadding and nose 90 and 92 (Figure 4). In Figures 5 and 6 end wadding member 100 is backed by means of wadding laminations 104 and 106 in Figure 5, and 104 and 108 in Figure 6, the adjacent laminations of wadding being formed to provide exploding pockets 110 which are filled with suitable explosive, and the pockets are connected by axially disposed passages 112, which are also powder filled. In the construction illustrated in Figure 5 the inner wadding member 106 is provided with the inwardly directed extension 114 extending into the pressure charge 116 (similar to charge 86 Figure 4) and the pocket 110 formed partially in wadding 106 is connected to said charge 116 through the axially disposed passage 118 which is powder filled. In the cartridge illustrated in Figure 6 inner pocket 110 is connected through the flexible fuse 120 to the pressure charge 122 (similar to charge 86 Figure 4), fuse 120 being also filled with suitable powder or ignition means.

Thus, when charges 116 or 122 are burned they also cause burning of the powder in powder filled passage 118 or powder filled fuse 120, causing the serial explosion of the powder filled pockets 110, such explosions operating to build sufficient pressure to project the wadding 110 and nose 102 in the same manner as wadding 90 and nose 92 (Figure 4) is projected.

In the cartridge construction illustrated in Figure 7 the charge retaining sleeve 124 is adapted to be closed as by a shell casing (not shown) similar to that illustrated at 72 in Figure 4, and said sleeve is flanged as at 126 to retain the wadding 128 and nose 130 thereof, similar to wadding 90 and nose 92 (Figure 4). Wadding 128 is provided with pocket 132 for the reception of a charge 134, such as that illustrated at 88 (Figure 4), and a separator and igniter 136, for loading and igniting purposes, is interposed between wadding 128, charge 134 and pressure charge 138 (similar to 86, Figure 4), said igniter being preferably provided with apertures 140 disposed so that charge 138 communicates with charge 134 through said apertures 140. Thus when the cartridge is detonated, the pressure charge 138 will cause ignition or burning of charge 134 through igniter 136, and the wadding 128 and nose 130 will be projected as already described with respect to the wadding and nose of Figures 1 to 3, inclusive.

Referring now to the construction illustrated in Figures 8 and 9, the charge retaining sleeve 142, similar to sleeve 76 (Figure 4), is adapted to be closed by the shell casing (not shown) similar to casing 72 (Figure 4) and said sleeve 142 is provided with the pressure charge 144, similar to charge 86 (Figure 4) retained between the liner (similar to 80—82, Figure 4) and the wadding 146 is provided with nose 148, said wadding and nose being retained by the flange 150 of sleeve 142. An igniter similar to igniter 84 may

be interposed between charge 144 and wadding 146, though it is not illustrated in Figure 8. Wadding 146 is provided with the honeycomb passages 152 for the reception of pressure charges similar to that illustrated at 88 (Figure 4). The honeycomb passages 152 may be said to be axially disposed, parallelly arranged passages extending from the inner surface of wadding 146, being open to communication with charge 144, but preferably terminating in spaced relation to the outer end of wadding 146, that is, in spaced relation to the nose 148. Firing of the cartridge causes pressure charge 144 to ignite the charges in passaegs 152, causing projection of the wadding 146 and nose 148 as already described with respect to the wadding and nose illustrated in Figures 1 to 3, inclusive.

In the device illustrated in Figures 10 and 11, a two-part device is illustrated wherein the capacity of the parts may be varied. In this form of the device the initially operated main, or detonating part indicated generally at 154 in Figure 10, that is, at the right of said figure, comprises the shell casing 156, similar to casing 72 (Figure 4), closed by the flanged closure 158 provided with the detonating cap 160. The charge retaining sleeve 162 projects outwardly from casing 156 and retains the pressure charge 164, similar to charge 86 (Figure 4), charge 164 being enclosed by turning over the end fingers 166 formed on the end of sleeve 162. Said fingers are generally pie-shaped or triangular shaped, to interfit with respect to each other, and are sealed tightly by means of the end seal member 168. Thus the part illustrated generally at 154 may contain a selected amount of charge 164, depending upon the length thereof (and diameter thereof).

A matching or wadding end indicated generally at 170, shown at the left of Figure 10, is of substantially the same diameter as sleeve 162 and is adapted to be associated with the part illustrated at 154. Part 170 comprises the substantially cylindrical sleeve 172 of suitable waterproof material, such as cardboard or the like, closed by the dished end 174. Wadding 176 is disposed in the dished end 174 and charge 178, similar to charge 88 (Figure 4), is interposed between wadding 176 and igniter 180, similar to igniter 84 (Figure 4), apertures 182 being provided in said igniter. The igniter is retained in postion by means of the flange 184 of sleeve 172. Sleeve 172 may be substantially cylindrical, and instead of the dished end retaining wadding 176, said wadding may be provided with a nose as 92 (Figure 4) held by a flange similar to 94, shown in Figure 4. Before association between parts 170 and 154, as where the parts are stored, apertures 182 are closed by means of the removable end seal 186 which is adhered to the igniter, being provided with a thumb tab 188 to facilitate ready removal thereof. Thus the loading (size of devices 154 and 170 and the contents thereof) determines the effect thereof.

In operation of this form of the device, where, for example, it is used in place of cartridge 38 of Figure 1, member 170, after shell 186 has been removed, is adapted to be inserted into recess 40, and member 154 can then be applied and the firing mechanism casing 24 can be associated with the body member 20. Operation of the firing mechanism will cause the detonating means 160 to cause oxidation of charge 164 which is communicated to the wadding 176 through ignition means 180 and charge 178, causing opera-

tion of the cartridge in a manner similar to that already described with respect to the cartridge illustrated in Figures 1 to 3, inclusive.

In the variations of the device shown it is appreciated that cartridges are provided permitting selected times of operations to be utilized as well as selected pressures to be effective, but wherein preferably complete oxidation or the complete cycle of pressure building is accomplished prior to the release of the pressure through ports **58**, as illustrated in Figure 1.

It is to be understood that this application is not to be limited by the exact embodiments of the device shown, which are merely by way of illustration and not limitation as various and other forms of the device will, of course, be apparent to those skilled in the art without departing from the spirit of the invention or the scope of the claims.

I claim:

1. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, laminations of wadding disposed outwardly of said oxidizable means, and a wadding nose for securing said wadding in said body member.

2. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, laminations of wadding disposed outwardly of said oxidizable means, and a wadding nose for securing said wadding in said body member, said wadding having explosive receiving pockets between said laminations.

3. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, laminations of wadding disposed outwardly of said oxidizable means, and a wadding nose for securing said wadding in said body member, said wadding having explosive receiving pockets between said laminations and an explosive filled passage between said oxidizable means and said pockets.

4. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, wadding disposed outwardly of said oxidizable means, and a wadding nose for securing said wadding in said body member, said wadding having an explosive receiving pocket disposed therein and communicating with said oxidizable means.

5. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, wadding disposed outwardly of said oxidizable means, and a wadding nose for securing said wadding in said body member, said wadding having an explosive receiving pocket disposed therein and communicating with said oxidizable means, and a separator disposed between said oxidizable means and wadding provided with apertures between said oxidizable means and pocket.

6. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, wadding disposed outwardly of said oxidizable means, and a wadding nose for securing said wadding in said body member, said wadding having a plurality of parallelly arranged explosive receiving pockets disposed axially of said cartridge communicating with said oxidizable means at one end thereof, the other end of said pockets being spaced from said nose.

7. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, a closure for the end of said body member spaced from said first named end, a wadding within the closure, said wadding having portions extending inwardly from the end of the closure and laterally covering a portion of the oxidizable means.

8. A blasting cartridge comprising a substantially cylindrical, flanged end provided with detonating means, a substantially cylindrical charge holding body member secured in said end and extending therefrom, relatively slow burning oxidizable means disposed in said body member for a portion of the length thereof from said end, laminations of wadding disposed outwardly of said oxidizable means, a wadding nose for securing said wadding in said body member, said wadding having explosive receiving pockets between said laminations, the inner pocket having an explosive filled flexible fuse extending into said oxidizable means and connecting said oxidizable means and the inner pocket, said laminations having explosive filled passages between said pockets.

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