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WATERPROOF BLASTING EXPLOSIVE ASSEMBLY

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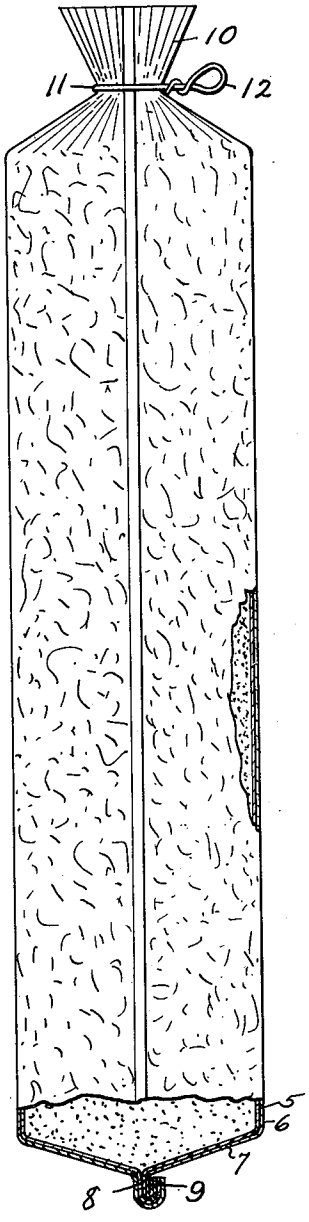


Fig. 1.

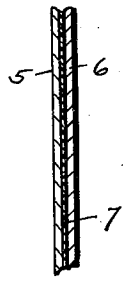


Fig. 2.

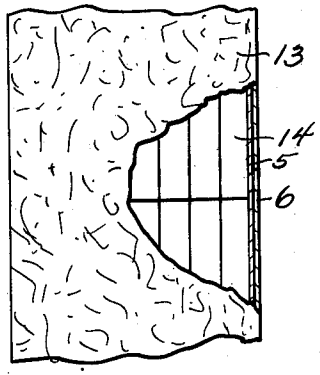


Fig. 3.

Inventors

William R. Farren and Joseph Smith Jr

By Samuel Herrick

Attorney

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WATERPROOF BLASTING EXPLOSIVE ASSEMBLY

William R. Farren and Joseph Smith, Jr., Tamaqua, Pa., assignors to Atlas Powder Company, Wilmington, Del., a corporation of Delaware

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22 Claims. (Cl. 102—6)

Our invention relates to improvements in blasting explosive assemblies and particularly to those of the water-resisting type. The principal object is to provide an economical yet sufficiently sturdy, safe and practical water-proof shell or container for blasting explosives. Other objects may become evident with the following description of our invention.

Heretofore, for submarine and other blasting operations where water is involved, the industry has depended almost entirely upon the inherent water-resistance of the explosive compositions used, rather than upon the water-resisting quality of the shell or envelope, in which the explosive is encased. It is for this reason that the more costly and higher water-resistant types of explosives, as for example the blasting gelatins and gelatinized dynamites, have been almost invariably employed for blasting under wet conditions. This has resulted in unduly high blasting costs, due not only to the relatively high cost of such type of explosives, but also to the fact that they are often less suitable in their action for yielding the most desirable blasting results, as compared with the less water-resistant types of explosives, which might otherwise be employed.

All previous attempts and proposals toward the production of suitable and practical water-proof shells, so far as we are aware, have fallen short of the mark because of either too great a cost or some other weak feature that could not be economically and practically overcome.

We are aware of such previous proposals as, for example, hermetically-sealed containers of such materials as metal, rubber, rubberized cloth, waxed paper, paper-board, etc., all of which are either too costly or otherwise objectionable, as for example, having insufficient flexibility (too rigid) or insufficient bursting and/or tearing strength to withstand the usual handling stresses involved with blasting operations; and especially where deep bore-holes and high water pressures are experienced. Further, we are aware that various skin coatings have been heretofore proposed for use in conjunction with conventional or other types of blasting explosive cartridges, as for example waxes, plastics, lacquers, tars, etc. All of these have the common defect, however, of being too difficult to apply so as to obtain always a completely water-proof envelope, on account of the fact that all require a period of time to set, dry or cool, during which time the coating is sufficiently soft to permit the formation of pores by the passage of air therethrough; such passage being induced by the differential between the internal and external pressures of the cartridge, which usually exists and always is present when the skin coating is applied at a temperature different from that of the surrounding atmosphere. A further defect that is common to most types of waxes, tars and plastics for this purpose is their tendency to be either too brittle or else too sticky, soft and weak for proper handling and good results within the temperature ranges involved during manufacture, storage and use.

In accordance with our present invention, we have discovered a type of water-resisting shell for blasting explosive assemblies which approaches the ideal, in that it obviates both the economic and technical disadvantages of the various water-proof blasting explosive assemblies heretofore known or used, as exemplified by those recited above; besides permitting the practical use of the less costly and less water-resisting types of explosives and explosive compositions, such as black powder, non-gelatinized dynamites, ammonium nitrate explosives, etc., even under severely wet conditions and under considerable heads of water.

Our novel explosive cartridge assembly comprises a charge of explosive contained in a shell or envelope, the wall of which is both flexible and extensible (i. e. capable of being easily bent, folded and enlarged in area by stress) as well as water and moisture repellent; both in its original and its deformed (bent, folded or enlarged) state and which envelope comprises a preformed sheet of inherently extensible material. By this we mean a sheet of material which, before being incorporated in the explosive cartridge, is stretchable under tension. An explosive cartridge of this novel type, which has been developed and perfected through extensive experimenting and thought, has the outstanding advantage of being capable of conforming itself within the confines of a bore-hole, without breaking, bursting or tearing with consequent entrance of water. For example, we have found that the properties of flexibility and extensibility enable our novel cartridge to be loaded into much more ragged and non-uniform bore-holes, without being injured, as compared with either a rigid or non-extensible cartridge, which will tend to become torn or bursted by the involved loading stresses. In the fabrication of our novel type of blasting explosive assembly, we prefer to employ a material comprising one or more layers of a water-proofed wrinkled or craped material as for

example, paper, cloth, etc. The said material is also preferably craped so that it may be extended or stretched in more than one direction. The water-proofing may be accomplished in any suitable manner, but preferably so that it will minimize the reduction in flexibility and extensibility of the craped material, as, for example, by impregnating, laminating or coating the material with a suitable flexible and extensible waterproofing medium as latex, tar, rubber, lacquer, asphaltic composition, wax, etc.

It may be observed that a straight rubber envelope may fall within the scope of the above definition, in that it may be both flexible and extensible. Rubber envelopes for explosives, however, have the disadvantages, as compared with our novel type of casing comprising a material of the type of craped paper or fabric, of being much more costly, of being more subject to time-deterioration and of having too much elasticity. Elasticity is objectionable in the magnitude experienced with an ordinary rubber film of sufficient weight to be usable as a suitable casing for blasting explosives, because this property tends to retard the conforming ability of a cartridge in the bore-hole. As soon as an elastic casing of this type is stretched, bent or extended, it is put immediately under tension and the greater the deformation the greater the tension. This makes such a cartridge more difficult to be charged into non-uniform and ragged bore-holes and decreases the ease with which the cartridge can be made to "spread" so as to completely fill the bore hole as, for example, where the highest possible charging density is desired. We accordingly specify that the material used for the shell body or casing of our novel water-proof blasting explosive assembly be essentially non-elastic, in addition to being flexible and extensible. Thisc ombinationo f properties defines the material as being capable of being deformed by bending, folding, stretching, etc., with but slight tendency to go back to its original form and size, subsequent to such deformation. By "craped", as used in the accompanying claims, we mean a preformed sheet of material not necessarily extensible in its composition but which has been rendered extensible by being provided with a multiplicity of wrinkles or fine corrugations, usually extending in many directions.

One example of a particularly desirable embodiment of our invention consists of a charge of blasting explosive contained in a shell body consisting of two layers or laminæ of craped paper cemented together by means of a substantially water-impervious internal layer or lamina of asphaltic composition. The outer lamina of craped paper is preferably coated and/or impregnated with a protective material as wax or lacquer, in order to render it more resistant to the softening and disintegrating action of the water and moisture, with which it may come in contact, as well as to add materially to the water-resisting property of the shell body material as a whole without undue reduction in the extensibility of the same. The seams, as well as the openings through which the explosive is charged into the shell, are preferably sealed by means of a water-resisting, flexible adhesive medium as latex, rubber cement, lacquer, asphaltic composition, tar, etc. In view of the usual sensitivity of blasting explosives to heat, it is quite preferable, however, to employ an adhesive medium for the final closure of the loaded explosive cartridge, that may be applied to effect a water-proof seal at or near atmospheric temperatures. For this reason, we prefer the use of such adhesive as latex, rubber cement, lacquers, etc., which may be applied in this more desirable manner.

The figures shown in the accompanying drawing are merely explanatory and are not intended to be limiting, since there are many other ways in which the invention may be applied.

Figure 1 is a view, partly in side elevation and partly in section, of an explosive assembly package embodying the principles of the invention.

Figure 2 is an enlarged sectional view through the material of which the container is formed; and

Figure 3 is a view, partly in side elevation and partly in section, of a type of large scale container in which sticks of dynamite, for example, may be stored, shipped, or otherwise contained.

Referring now to the drawing, **5** designates the inner lamina, **6** the outer lamina, and **7** the interposed lamina of a water-proofing composition of any of the materials herein defined. The laminæ **5** and **6** consists of craped material, preferably craped paper, though we contemplate the use of any suitable "crape" or otherwise extensible and substantially non-elastic material; the advantages of which have already been explained.

A sheet of material consisting of the laminæ, shown in Fig. 2, is suitably shaped to form a container, such for example as that illustrated in Fig. 1 where the sheet of material is first brought to tubular form. This may be accomplished by providing the material with a longitudinal seam along its abutting edges, cemented with a suitable water-proofing composition of the class defined herein.

There are numberless ways in which the ends of the receptacle may be sealed, and we contemplate employing any of the well known bag folds employed in the manufacture of paper habs. One way in which a container may be sealed at the bottom is illustrated in the accompanying drawing wherein the material is merely bent over upon itself; suitable adhesive being applied, at **8**, and, if desired, again, at **9**, to seal first the abutting faces to each other and then to seal the turned over edges at the point **9**. Another way of sealing an end of a tubular structure of this sort is to gather the material of the end of the tube, as indicated at **10**, applying a wire bag-tie, or other suitable binding element **11**, thereto, and dip the gathered end into a body of water-proof sealing composition such as tar, asphaltic composition, latex, rubber cement or lacquer. Where the bag-tie is used, its eye **12** provides means for the attachment of a lowering cord by which the explosive assembly may be lowered into a bore hole. We also contemplate the drawing of the gathered end **10**, by means of bag-tie or equivalent element about a rubber plug, in order to seal the package and in the manner described in the patent to Farren, No. 1,890,726, dated December 13, 1932.

In Figure 3, we have indicated that laminated extensible material of the character described may be employed in the formation of containers of considerable size. In said figure, a container **13**, formed of the laminated extensible sheet herein described, serves as a receptacle for a plurality of sticks of dynamite **14**. This illustration is given merely to emphasize the fact that our described material is of utility in relations other than as the casings of single cartridges. Material of this

nature constitutes cheap and efficient means for the shipment of explosives into humid countries, or under other adverse weather conditions, with the assurance that such shipments will be found in first class condition upon arrival as far as any deterioration from moisture is concerned.

It will be understood that the above example is not limiting and that we contemplate a vast number of variations thereof, all of which fairly come within the scope of this specification. We may, for example, employ one or a multiplicity of craped paper or fabric laminæ in conjunction with one or more laminæ or coatings of a suitable water-proofing substance. We may employ various media for fastening and water-proofing the seams, as described above, and we may employ various means of closing the ends of the shell body as well as various attachments, if desired, to make for easier handling and loading of the cartridges.

It should be further understood that we are not limited as to size or shape of the explosive assembly, which may be varied at will in accordance with the requisites of practical use. Nor are we limited as to the kind, type, grade, form or constitution of the blasting explosive embodied in our novel assembly. We may, for example, load a loose blasting explosive directly into the novel type of casing or we may load it therein in the form of a multiplicity of cartridges or pellets of conventional types, with or without individual shell coverings, coatings, etc.

Further, relative to the auxiliary water-proofing treatment of the casing of the assembly, we may choose to not treat it at all, or we may apply the protective medium at the time the material is manufactured or any time prior to or subsequent to the loading of the assembly with blasting explosive; as for example, by coating, spraying, dipping, etc. This said treatment may also be applied to one or more or all of the craped laminæ, as requirements dictate. By the term extensible material as used in the appended claims, I mean a material having inherent extensibility, as for example the craped material described, and I do not mean to include ordinary plain paper which is not inherently extensible of itself even though it may be folded into plaits to make an extensible structure.

Having described our invention, what we claim is:

1. A blasting explosive assembly comprising a charge of blasting explosive and about the said explosive charge a container, substantially of a flexible and extensible material consisting of two laminae of craped paper cemented together by means of a water-resisting inner lamina of asphaltic composition.

2. A blasting explosive assembly as in claim 1, further characterized by the seams and openings of the said container being sealed and fastened by means of at least one flexible and water-resisting adhesive substance of the group consisting of tar, asphaltic composition, latex, rubber cement and lacquer.

3. A blasting explosive assembly comprising a body of explosive material and a container for said explosive material, the walls of said container consisting of at least one layer of craped material that is flexible and inherently extensible but substantially non-elastic, and at least one layer of water-proofing composition on the layer of craped material.

4. A blasting explosive assembly as in claim 1, characterized by at least one of the creped paper laminæ being treated with an auxiliary water and moisture-repelling medium.

5. A blasting explosive assembly as in claim 1, characterized by at least one of the craped paper laminæ being treated with an auxiliary water and moisture-repelling medium taken from the group consisting of paraffin wax, ceresine wax and latex.

6. A blasting explosive assembly as in claim 1, characterized by the outer lamina of craped paper being treated with molten paraffin wax.

7. A blasting cartridge assembly comprising a blasting explosive charge contained in a sheath consisting of a flexible, extensible, water-resisting and essentially non-elastic material that substantially comprises a preformed sheet the seams and openings of which are sealed and fastened shut by means of a flexible water resisting adhesive substance, and at least one end of which is held in a gathered fold by means of a wire bag-tie.

8. A blasting explosive assembly comprising a water-proof shell that is flexible, extensible in more than one direction but non-elastic, and a charge of blasting explosive therein, said shell consisting of two laminæ of crepe paper cemented together by means of a water resisting elastic composition.

9. A blasting explosive assembly as in claim 8 characterized by the seams and openings of the said shell being sealed and fastened by means of at least one flexible water resisting adhesive substance of the group consisting of tar, asphaltic composition, latex, rubber, cement and lacquer.

10. A blasting explosive assembly comprising a water-proof shell and a charge of blasting explosive therein substantially completely filling the interior of said shell and of a nature sufficiently freely moving to be flowable in all directions, the walls of said shell comprising at least one layer of crape material that is flexible and extensible in substantially all directions but substantially non-elastic.

11. A blasting explosive assembly comprising a water-proof shell and a charge of blasting explosive therein substantially completely filling the interior of said shell, the walls of said shell comprising at least one layer of crepe material that is flexible and extensible in more than one direction but substantially non-elastic, and a layer of waterproofing composition on the layer of crepe material.

12. A blasting explosive assembly comprising a body of blasting explosive and a container about the said explosive; the said container being characterized as made of a moisture-resisting material that is essentially flexible, extensible (in more than one direction), non-elastic and at least a substantial part of which consists of a preformed sheet of inherently extensible material.

13. A blasting explosive assembly comprising a body of blasting explosive and a container about the said explosive; the said container being characterized as made of a moisture-resisting material that is essentially flexible, extensible, non-elastic and comprises at least one preformed lamina of flexible and inherently extensible, craped material.

14. A blasting explosive assembly as recited in claim 13, wherein the said preformed lamina consists of flexible and extensible craped paper.

15. A blasting explosive assembly comprising a body of blasting explosive and a container

about the said explosive; the said container being characterized as made of a moisture-resisting material that is essentially flexible, extensible, non-elastic and substantially comprises at least one lamina of extensible craped material and at least one lamina of an extensible and flexible water-resisting material.

16. A blasting explosive assembly as recited in claim 12, further characterized by the seams and openings of the said container being sealed and fastened by means of a flexible and water-resisting adhesive substance.

17. A blasting explosive assembly as in claim 15 wherein the said water-resisting material is of the group consisting of tars, asphaltic compositions, latex, rubber cements and lacquers.

18. A blasting explosive assembly comprising a charge of blasting explosive and a water-proof shell container for the same consisting of a sheet of relatively strong, tough material that is flexible, extensible in substantially all directions, but is non-elastic, said sheet of material being coated with a flexible, water-resisting substance.

19. A blasting explosive assembly comprising a body of blasting explosive and a container about the said explosive; the said container being characterized as made of a moisture-resisting material that is essentially flexible, non-elastic, and at least a substantial part of which consists of a preformed sheet of inherently-extensible material.

20. A blasting explosive assembly comprising a body of blasting explosive and a container about the said explosive; the said container being characterized as made of a moisture resisting material that is essentially flexible, extensible, non-elastic and at least a substantial part of which consists of a material which when in flat form presents a sheet preformed to render it inherently extensible.

21. A blasting explosive assembly comprising a body of blasting explosive and a container about the said explosive; the said container being moisture resisting, flexible and non-elastic and comprising a preformed sheet of inherently extensible material and a layer of flexible, extensible, water-resisting material.

22. A blasting explosive assembly comprising a body of blasting explosive and a container about the said explosive; the said container being moisture resisting, flexible, and non-elastic and comprising a layer of flexible, extensible, water-resisting material between two preformed sheets of inherently extensible material.

WILLIAM R. FARREN.
JOSEPH SMITH, JR.