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G. B. HOLDERER
EXPLOSIVE CARTRIDGE
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Fig. 1,

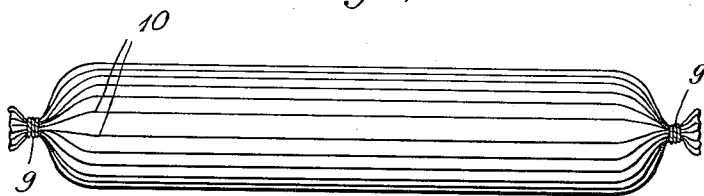


Fig. 2,

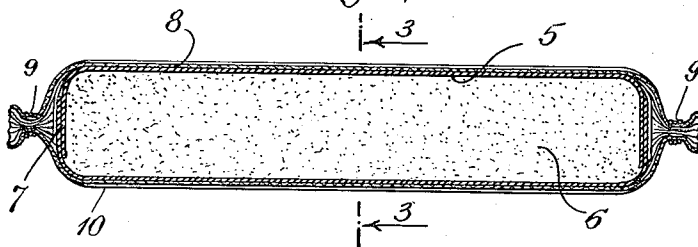
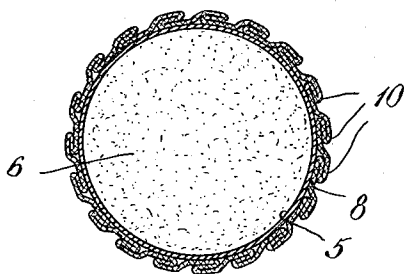


Fig. 3



INVENTOR
George B. Holderer
BY
Pennie Dano Mason & Edwards
ATTORNEY

UNITED STATES PATENT OFFICE.

GEORGE B. HOLDERER, OF NEW ROCHELLE, NEW YORK, ASSIGNOR TO AIR REDUCTION COMPANY, INCORPORATED, OF NEW YORK, N. Y., A CORPORATION OF NEW YORK.

EXPLOSIVE CARTRIDGE.

Application filed July 23, 1924. Serial No. 727,652.

To all whom it may concern:

Be it known that I, GEORGE B. HOLDERER, a citizen of the United States, residing at New Rochelle, in the county of Westchester, State of New York, have invented certain new and useful Improvements in Explosive Cartridges; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to explosive cartridges, and particularly to a type of cartridge, containing a non-explosive material of a carbonaceous nature, which is adapted to be saturated with liquid oxygen before insertion in the cavity in which it is to be exploded. Such cartridges have been suggested heretofore and numerous attempts have been made to employ them for commercial purposes. The cartridges heretofore used have been unsatisfactory because of the impossibility of properly loading the cavities. Such cartridges have been enclosed in paper wrappers. At the low temperatures accompanying the use of liquid oxygen, paper becomes brittle and if the cartridge is tamped in the cavity the wrapper bursts and the explosive is scattered in the numerous crevices existing in the rock or other material to be shattered. Portions of the carbonaceous material may be thrown from the cavity in an unburned condition forming dangerous powder trains which may cause premature explosions. If, on the other hand, the cartridge is not tamped it does not fill the cavity completely and the air spaces surrounding the cartridge materially reduce the effectiveness of the explosion. This is particularly true where the required drilling must be done in stages, the hole being reduced in diameter in the lower portions. With a cartridge of uniform diameter it is apparent that such a hole cannot be filled properly. In either case the effectiveness of the explosion is not sufficient to warrant the substitution of liquid oxygen cartridge for other explosives in commercial operations on a large scale.

It is the object of the present invention to provide a cartridge of the character described having numerous advantages and capable of satisfactory and efficient use in competition with other explosives.

Further objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and accompanying drawing, in which

Fig. 1 is a side elevation of a cartridge constructed in accordance with the invention;

Fig. 2 is a longitudinal section through the cartridge; and

Fig. 3 is an enlarged transverse section showing the peculiar construction of the cartridge casing.

In carrying out the invention I may use any suitable carbonaceous or other combustible material, preferably in finely divided form to facilitate the absorption of an adequate amount of liquid oxygen. Lamp black and carbon black are satisfactory materials for this purpose but others may be substituted. In addition to the carbonaceous material other substances may be added as fillers to improve or increase the explosive effect of the cartridge or to reduce the cost thereof. The particular materials employed in the body of the cartridge are not a part of the present invention which relates more especially to the wrapper therefor.

This wrapper comprises two parts, one of which is adapted to firmly hold the carbonaceous material during shipment of the cartridge and until it is placed in the cavity where it is to be exploded. The other part is designed particularly to permit expansion of the cartridge in the cavity without loss of any of the material therein contained. The inner wrapper is preferably made of paper which is frangible, particularly at low temperatures. A cheap quality of paper may be used for this purpose so long as it is sufficiently strong to withstand handling when reinforced by the outer wrapper. This wrapper is preferably made of a closely woven textile material which will prevent the escape of the carbonaceous material and is formed with longitudinal pleats permitting the cartridge to be collapsed lengthwise and thus to expand so that it will conform with the shape of the cavity. This outer wrapper may be waterproofed by a coating or impregnation of any suitable material which will permit liquid oxygen to pass therethrough but which will exclude

water. In this way the cartridge may be rendered impervious to water in the cavity. Linseed oil is a suitable material for application to the textile wrapper for the purpose specified but other substances may be used.

The cartridge is manufactured preferably by forming a tube of paper and filling the tube with the carbonaceous material or composition. The ends of the paper tubes may be folded to retain the material therein. The paper tube is then inserted in the textile wrapper, the ends of which are secured by tying or in any other suitable way. This textile wrapper is of somewhat larger diameter than the paper wrapper and the surplus material is arranged in the form of longitudinal pleats in order to permit expansion of the cartridge as described.

The cartridge in this form is harmless and can be shipped without special precautions. At the point where it is to be used it is dipped in liquid oxygen and allowed to remain for a sufficient time to permit absorption of sufficient oxygen to form an explosive composition. The cartridge thus soaked with liquid oxygen is placed in the cavity and tamped. The paper wrapper becomes frangible at low temperatures and the tamping causes it to break so that the content is released. The explosive composition expands into the textile wrapper which prevents escape thereof while permitting nevertheless the complete filling of the cavity. Where the cavity is large a number of cartridges can be inserted and tamped in place until the filling is complete.

The cartridge is fired by the insertion of the usual detonator in the head thereof. The detonator can be exploded by means of a fuse or electrically as desired.

Referring to the drawing, 5 indicates the wrapper of paper or equivalent material, which is capable of accomplishing the desired result, enclosing the carbonaceous material 6 and holding it firmly in shape. The wrapper 5 is folded at 7 to retain the material therein. The cartridge thus formed is inserted in the outer wrapper 8 of textile material which is drawn over the ends of the cartridge and tied or otherwise fastened at 9. As indicated the wrapper 8 is formed with a plurality of pleats 10 which permit expansion of the cartridge when it is tamped in the cavity. The wrapper 8 may be coated or impregnated with a water-repellent substance. In this form the cartridge is complete and ready for shipment to the point where it is to be used. At that point it is soaked in liquid oxygen and placed in the cavity before the oxygen has an opportunity to evaporate.

Among the particular advantages of the invention are the elimination of air space in the cavity and the increased amount of

explosive material which can be inserted in a cavity of given dimensions owing to the possibility of expanding the cartridge, with a consequent increase in the break of from 60 to 100 per cent, an increased quantity of liquid oxygen absorbed because of absorptive character of the textile wrapper and lengthened life of the cartridge after soaking in the liquid oxygen because of the tendency of the textile wrapper to retard evaporation.

Various changes may be made in the details of construction and arrangement of the cartridge without departing from the invention or sacrificing any of the advantages thereof.

I claim:—

1. In an explosive cartridge a filling of carbonaceous material, an inner wrapper therefor of frangible material and an outer expansible wrapper adapted to hold the filling when the inner wrapper is broken and to conform to the shape of the cavity in which the cartridge is placed.

2. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of frangible material and an outer wrapper adapted to hold the filling when the inner wrapper is broken, said outer wrapper having longitudinal pleats permitting the cartridge to expand and to conform thus to the shape of the cavity in which the cartridge is placed.

3. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of paper and an outer expansible wrapper adapted to hold the filling when the inner wrapper is broken and to conform to the shape of the cavity in which the cartridge is placed.

4. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of paper and an outer expansible wrapper adapted to hold the filling when the inner wrapper is broken, said outer wrapper having longitudinal pleats permitting the cartridge to expand and to conform thus to the shape of the cavity in which the cartridge is placed.

5. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of frangible material and an outer expansible wrapper of textile material.

6. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of frangible material and an outer expansible wrapper of textile material, said outer wrapper having longitudinal pleats permitting the cartridge to expand when the inner wrapper is broken.

7. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of paper and an outer expansible wrapper of textile material.

8. In an explosive cartridge a filling of

carbonaceous material, an inner wrapper of paper and an outer wrapper of textile material having longitudinal pleats therein to permit expansion of the cartridge when the inner wrapper is broken.

9. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of paper and an outer expansible wrapper adapted to hold the filling when the inner wrapper is broken and to conform to the shape of the cavity in which the cartridge

is placed, said outer wrapper being impregnated with a water-repellent material.

10. In an explosive cartridge a filling of carbonaceous material, an inner wrapper of paper and an outer expansible wrapper of textile material, said textile material being impregnated with a water-repellent material.

In testimony whereof I affix my signature.

GEORGE B. HOLDERER.