March 12, 1929. H. S. HART 1,705,248

BLASTING CARTRIDGE

Filed Oct. 1, 1927

Fig. 1.

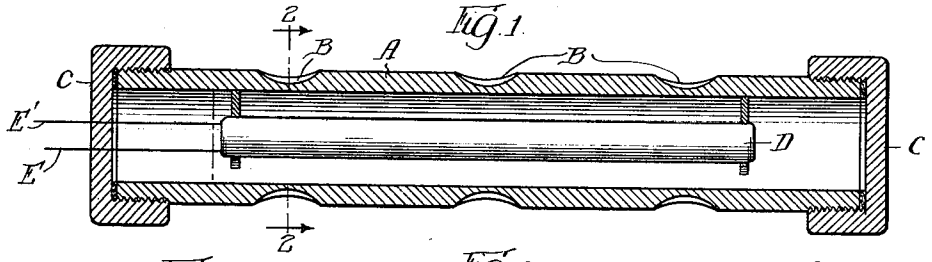


Fig. 2.

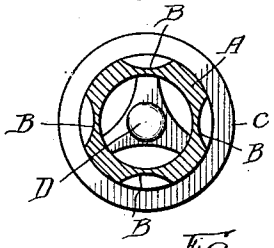


Fig. 3.

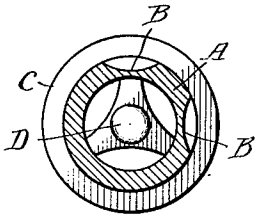


Fig. 4.

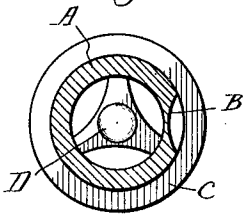


Fig. 5.

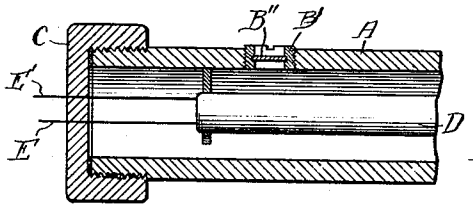


Fig. 6.

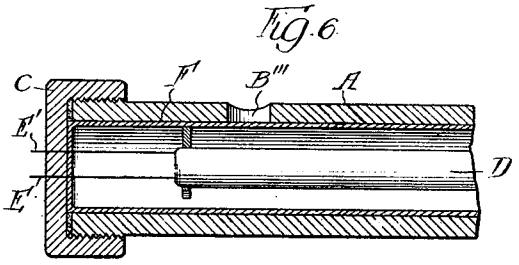


Fig. 7.

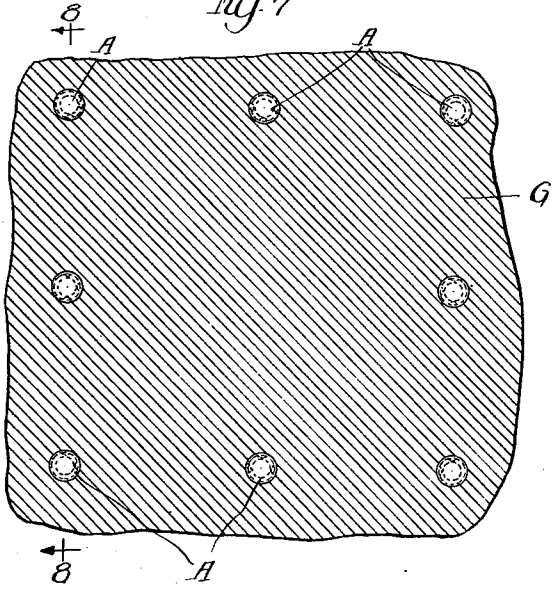
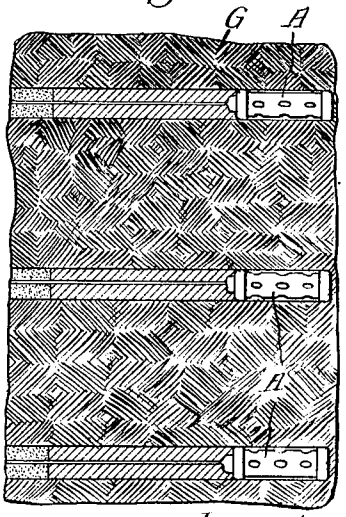


Fig. 8.



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UNITED STATES PATENT OFFICE.

HARRY S. HART, OF CHICAGO, ILLINOIS.

BLASTING CARTRIDGE.

Application filed October 1, 1927. Serial No. 223,262.

My invention relates more particularly to apparatus for blasting coal or other material capable of being brought down by blasting methods in mines as shown and described for example in the British patent to Giffard No. 12,089 of 1889 and in the United States patent to Ferrell, Helmholtz and Crawford No. 1,632,887 dated June 21st, 1927, and has for its object to provide an improved means for blasting in which the sudden expansion of carbon dioxide in solid or liquid form causes an explosion of gas directly through the longitudinal wall of the cartridge and in transverse direction therefrom. Other and further objects will appear hereinafter.

In the accompanying drawings, Fig. 1 is a longitudinal section illustrating one embodiment of my invention. Figs. 2, 3 and 4 are cross sections on the line 2—2 of Fig. 1, showing various possible arrangements of the weakened portions of the wall. Fig. 5 is a longitudinal section of a portion of a cartridge showing a modified form of my invention. Fig. 6 is a longitudinal section of a portion of a cartridge showing another modification. Fig. 7 is a front elevation illustrating a wall of coal in the mine, with my improved cartridges arranged ready for blasting. Fig. 8 is a longitudinal section on the line 8—8 of Fig. 7.

In the use of carbon dioxide for blasting purposes it is desirable that the expansive effort of the gasified carbon dioxide be such that the tendency for the cartridge to recoil is lessened and that at the same time the expansion shall take place in a direction to bring down the material in large blocks without the production of dust or fine material and that to this end the expansion be initiated in a predetermined direction.

In the embodiment of my invention illustrated I provide a cylindrical metallic casing as shown in the drawings in which A is the cylindrical longitudinal wall of the cartridge closed at each end by end walls C, which may be rigidly attached to the longitudinal cylindrical wall A in any preferred manner, as for example, by the screw threads shown in Fig. 1. Within this casing is placed a light metallic casing D containing a suitable explosive adapted to be ignited through electrical connections E—E′. Carbon dioxide in the non-gaseous state, i. e., liquid or solid carbon dioxide, fills the remainder of the cartridge. The walls A and C of the cartridge are of sufficient strength to resist a predetermined pressure of the carbon dioxide gas when the liquid or solid carbon dioxide is gasified by the action of the explosive in the casing D except at certain weakened portions of the wall A. These weakened portions, as illustrated in Fig. 1, may be formed by reducing the thickness of the wall at such points as it is desired to be ruptured when the predetermined pressure is reached upon gasification of the carbon dioxide.

By reference to Figs. 2, 3 and 4, it will be noted that these weakened portions may be arranged at any desired point in the wall. In Fig. 2 they are shown at four points in the circumference of the wall so that upon rupture of all the weakened portions the expanding gas will be directed in four ways. In Fig. 3 they are shown at two points in this wall so that the gas will expand in two directions at right angles to each other. In Fig. 4 there is a single weakened portion, permitting the expansion of the gas in a single direction. While I have shown in Fig. 1 these weakened portions as formed at intervals along the length of the longitudinal wall, it is obvious that the weakened portions may be located at one end only, at two ends, or at the middle, or in fact at any selected point or points on this longitudinal wall.

Fig. 5 illustrates a modification of the invention showing a different method of forming the weakened portions of the wall. In this case, an opening is made through the wall in which opening is screwed a plug B′ containing a plate B″ of less thickness than the longitudinal wall A and consequently weaker. Fig. 6 shows another modification in which the wall A is provided with an opening B‴ and the carbon dioxide is enclosed in a metallic casing F closely fitted to the bore of the cartridge, the explosive casing D being contained within the casing F. At the points B‴ the wall of this interior casing forms a weakened portion through which, upon rupture, the gasified carbon dioxide escapes as above described.

In Figs. 7 and 8 I have illustrated a method of using my cartridges. In these figures G represents the wall of coal to be brought down in the mine and the cartridges provided with the proper weakened portions may be arranged as here shown. For example, at the corners I place the cartridges A provided with the weakened portions at right angles to each other as illustrated in Fig. 3. The explosion from these cartridges being trans-

verse with respect to the body of the cartridge and issuing directly from this body will be horizontal and vertically downward with respect to the body of coal to be brought down. In like manner at the intermediate points I place cartridges with the weakened portions arranged at three points so that the intermediate cartridges in the upper and lower horizontal lines will direct a horizontal explosion toward the corner cartridges and a vertical explosion through the body of the coal, while the intermediate cartridges in the vertical lines will direct a vertical explosion toward the corners and a horizontal explosion through the body of the coal. It will be understood, however, that any suitable or desirable arrangment of the cartridges may be made.

It will be seen from the above description that I have provided a cartridge in which the gas under high pressure emerges directly from the longitudinal wall of the cartridge and crosswise or transversely with respect thereto, thus making it possible to direct the explosive force of the gas in any desired direction into the coal body and in such a manner that it may readily seek passage through the crevices existing in the coal body, reducing the tendency of the cartridge to recoil which exists where carbon dioxide is shot longitudinally through the cartridge and without the shattering of the entire body of the cartridge, thus scattering the broken metal through the coal.

It will be understood that while I have illustrated and described my invention in various possible embodiments, I contemplate such changes and modifications as come within the spirit and scope of the appended claims.

I claim:

1. A blasting cartridge comprising a rigid casing, a charge of carbon dioxide in the non-gaseous state in the casing, means for raising the temperature of the carbon dioxide to and above the critical temperature of non-gaseous carbon dioxide, and rupturable means at a predetermined point in the wall of the cartridge permitting the escape of gaseous carbon dioxide at a predetermined pressure and in transverse direction with respect to the casing.

2. A blasting cartridge comprising a casing having walls of a strength to resist the pressure of gasified carbon dioxide confined therein except at predetermined points, a wall of the cartridge being provided with weakened portions at such points, said weakened portions being located in the wall so as to permit the escape of the gasified carbon dioxide upon rupture of the weakened portions in a direction transverse with respect to the casing.

HARRY S. HART.