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BLASTING CARTRIDGE

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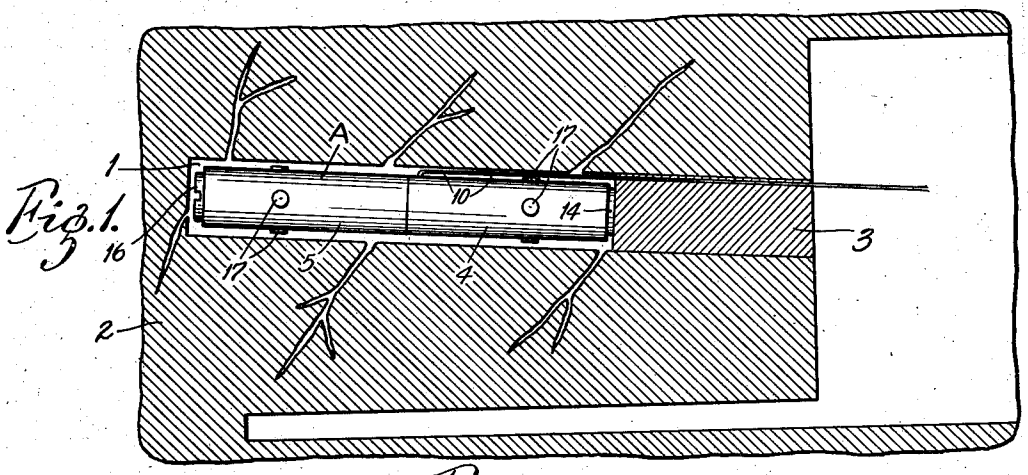


Fig. 1.

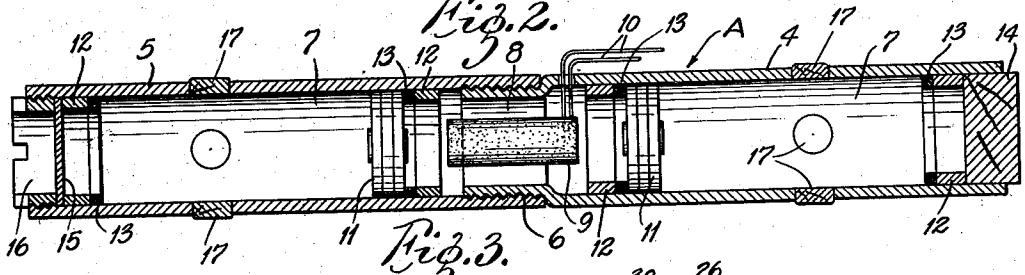


Fig. 2.

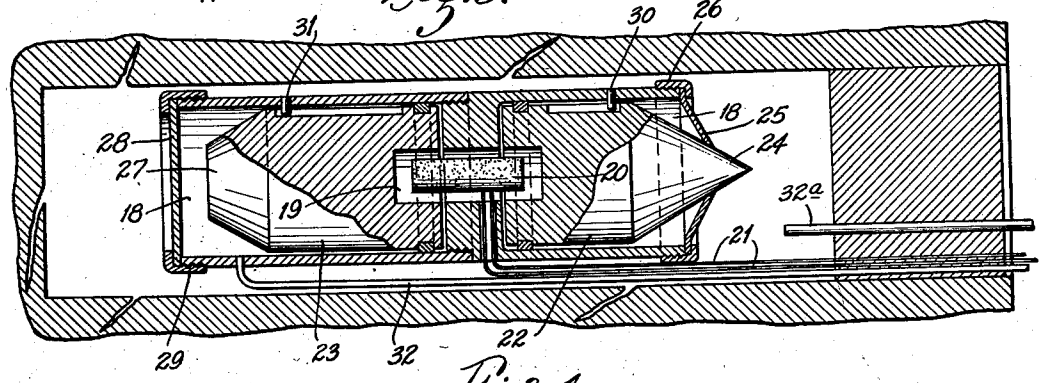


Fig. 3.

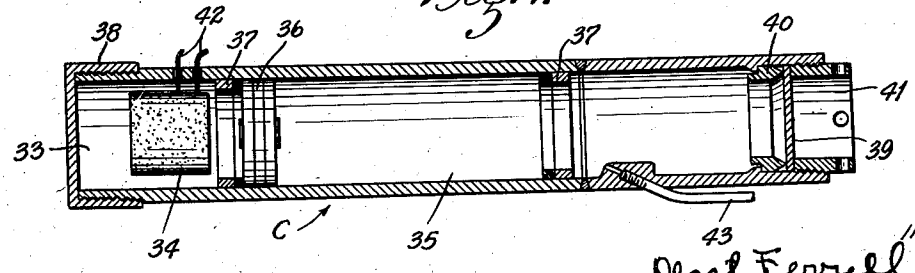


Fig. 4.

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BLASTING CARTRIDGE

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Application October 18, 1933, Serial No. 694,026

6 Claims. (Cl. 102—7)

This invention relates to blasting cartridges. It has for its principal objects to provide a self-contained blasting cartridge which will increase the effectiveness of the blast, which will prevent the escape of flames or noxious gases from the cartridge; which will facilitate assembly and disassembly of the parts; and which will be of simple and economical construction and of compact design. The invention consists in the blasting cartridge and in the parts and combinations and arrangements of parts hereinafter described and claimed.

In the accompanying drawing, which forms part of this specification and wherein like symbols refer to like parts wherever they occur,

Fig. 1 is a vertical section through a body to be blasted, showing in side elevation a blasting cartridge embodying our invention mounted in a blast hole provided therefor in said body,

Fig. 2 is an enlarged central longitudinal section through said blasting cartridge,

Fig. 3 is a view similar to Fig. 1 showing in central longitudinal section a modified form of blasting cartridge; and

Fig. 4 is a view similar to Fig. 3 showing another modified form of blasting cartridge.

Referring to Fig. 1 of the accompanying drawing, a blasting cartridge A embodying our invention is mounted in a blast hole 1 provided therefor in the body of coal or other material 2 to be blasted and the hole is closed by suitable stemming 3. As shown in Fig. 2, the blasting cartridge A comprises separable hollow cylindrical sections 4 and 5 that are detachably connected together by a threaded leak proof joint 6. The cartridge is provided with end chambers 7, adapted to be filled with a suitable blasting fluid, and an intermediate chamber 8 adapted to contain an explosive or other expanding agent 9 adapted to be fired by an electric current conducted thereto through wires 10. The end and intermediate chambers are separated by fluid tight partitions in the form of pistons 11 that are slidable in the end chambers 7. Suitable stop rings or shoulders 12 are located inside the cartridge for limiting the sliding movement of the pistons in the end chambers 7. Rubber buffer or cushioning rings 13 are mounted against the piston opposing faces of the stop rings 12 to cushion the force of the pistons 11. The open ends of the cartridge constitute vent openings at the outer ends of the respective end chambers 7. The vent opening in section 4 of the cartridge is temporarily closed by a wooden plug 14; and the vent opening in the other cartridge section 5 is closed by a rupturable disk 15 of metal or other suitable material, which is clamped between the outer face of the adjacent piston stop 8 and a ring nut 16 threaded into said opening. The rupturable disk 15 is made of material adapted to rupture at a pressure that is considerably less than would be required to rupture the other walls of the cartridge. The end chambers may be provided with side vent openings that are temporarily closed by means of wooden plugs 17.

In the use of the above blasting cartridge, the two sections 4 and 5 thereof are separated, the explosive 9 is inserted in the opening in the inner end of one of said sections and the firing wires 10 connected to said explosive. The two cartridge sections 4 and 5 are then screwed together and the pistons 11 are then slid inwardly in the respective end chambers 7 in abutting relation to the stops 12 at the inner ends thereof. The cartridge chambers 7 are then filled with any suitable blasting fluid, such as water, gas or air, either under pressure or without pressure, or a thin liquid of mud and water or mud, water and air, is then poured into each end chamber 7 to substantially fill the same and the vent openings in said chambers are then closed by means of the closure members 14, 15 and 17. The loaded cartridge is then placed in the blast hole 1, in the coal body 2, the hole closed by the stemming 3 and an electric current passed through the wires 10 to explode the explosive 9 in the expansive intermediate or combustion chamber 8.

The expanding gases resulting from the explosion in the intermediate chamber 8 act upon the pistons 11 in the inner ends thereof to force the same outwardly in said chamber, thereby exerting a sudden pressure or impulse on the blasting fluid therein and causing the closures 14, 15 and 17 to open and the fluid to be discharged through the vent openings closed thereby at a velocity and pressure high enough to break up a large mass of the surrounding coal body 2. After the blast, the cartridge may be recovered and again used by reloading and replacing the vent closures.

The modified cartridge shown in Fig. 3 is also provided with end and intermediate chambers 18 and 19, respectively. The intermediate chamber 19 is provided with a suitable explosive 20 adapted to be exploded by an electric current supplied thereto through suitable wires 21; and the end chambers 18 are provided with pistons 22 and 23, respectively. The piston 22 in one end chamber has a conical outer end portion 24

adapted to close an opening provided therefor in a rupturable sealing member 25 that covers the vent opening at the outer end of said chamber and is held in place by means of a threaded clamping ring 26. The piston 23 in the other end chamber has its outer end portion 27 shaped after the manner of a truncated cone; and the vent opening in the outer end of said chamber is sealed by means of a rupturable disk 28 that is held in place by means of a threaded retaining ring 29. If desired, the pistons 22 and 23 may be prevented from leaving the chambers in which they work by means of pins 30 and 31, respectively, which are fixed to the walls of said chambers and seat within longitudinal grooves provided therefor in said pistons. A suitable pipe line 32 leads to the chamber containing the piston 23 for supplying fluid under pressure to the space between the outer ends of said chamber and piston.

With the blasting cartridge shown in Fig. 3, it is preferable to place the coal body in a state of strain, prior to the main blast, by forcing into it a fluid, gas or mud stream under sufficient pressure to set up the desired strain. The pressure building medium is applied to the body through a pipe 32*a* leading to the blast hole and fills up all fissures and cracks in the vicinity thereof, and thereby builds up a strain that greatly increases the effectiveness of the blast produced by the blasting cartridge. The pressure building medium may or may not be under pressure and may be supplied by a separate hole or holes in coal body. With this form of cartridge, the pistons are forced outwardly at a high velocity by the explosion of the explosive charge and rupture the seals at the ends of the cartridge. The piston 23 having the blunt end of relatively small area is forced into the static medium surrounding the cartridge, resulting in a high pressure wave which causes an initial fracture of the coal body. The piston 22 in its outward movement compresses the fluid in its chamber to a higher pressure sufficient to rupture the vent closure and discharge said fluid from said chamber into the static medium surrounding the cartridge, thereby imparting a terrific shock or impulse to the medium which causes a general fracture or breaking down of the coal body.

The modified cartridge C shown in Fig. 4 is provided with a chamber 33 adapted to receive explosive charge 34 and a chamber 35 adapted to receive the blasting fluid. The chambers 33 and 35 are separated by a piston 36 working between cushioned stops 37 provided therefor in the chamber for the blasting fluid. The outer end of the explosion chamber 33 is closed by means of a threaded cap 38. The outer end of the chamber 35 for the blasting fluid is closed by a rupturable disk 39, which is clamped between the knife edge of a ring 40 seated against a shoulder provided therefor in said chamber, and a ring nut 41, which is threaded into the opening closed by the disk and forms a die against which the seal is ruptured. The explosive in the explosion chamber is exploded by an electric current supplied thereto through wires 42 leading into said chamber; and the blasting fluid is supplied to the chamber through a pipe line 43 leading thereto. With this form of cartridge, the expanding gases resulting from the explosion of the explosive charge force the piston longitudinally of its chamber in the direction of the rupturable sealing disk therefor, thereby further compressing the fluid in said chamber sufficiently to rupture the disk and allow such pressure to be transmitted to the drill hole and thus bring about the blasting operation.

Each of the above described blasting cartridges greatly increases the effectiveness of the blast, it is simple and comparatively inexpensive, it is adapted for ready assembly and disassembly and repeated use, and it prevents the noxious gases resulting from the explosion of the explosive charge from escaping into the mine.

It is evident that numerous changes may be made without departing from our invention and we do not wish to be limited to the precise arrangements shown and described.

What we claim is:

1. A blasting cartridge comprising a casing having two pistons slidable therein, rupturable sealing disks for closing the ends of said casing, and an explosive charge in said casing between said pistons, one of said pistons having a conical end portion adapted to seat within an opening provided therefor in the rupturable disk adjacent thereto.

2. A blasting cartridge comprising a casing having two pistons slidable therein, rupturable sealing disks for closing the ends of said casing, and an explosive charge in said casing between said pistons, one of said pistons having a truncated conical end portion adapted to engage the rupturable disk adjacent thereto.

3. A blasting cartridge comprising a casing having two pistons slidable therein, rupturable sealing disks for closing the ends of said casing, an explosive charge in said casing between said pistons, one of said pistons having a truncated conical end portion adapted to engage the rupturable disk adjacent thereto, and means for supplying a blasting fluid to the space between said last mentioned piston and said disk.

4. A blasting cartridge comprising a casing having two pistons slidable therein, rupturable sealing disks for closing the ends of said casing, an explosive charge in said casing between said pistons, one of said pistons having a truncated conical end portion adapted to engage the rupturable disk adjacent thereto, means for supplying a blasting fluid to the space between said last mentioned piston and said disk, and means for limiting the outward travel of said pistons.

5. A blasting cartridge comprising a casing having two pistons slidable therein, rupturable sealing disks for closing the ends of said casing, and an explosive charge in said casing between said pistons, said casing being made of separable sections whereby access may be had to said casing to enable the explosive charge to be placed therein.

6. A blasting cartridge comprising a casing having a piston slidable therein, an explosive charge in one end of said casing, a removable cap for said end of said casing, a rupturable sealing disk in the other end of said casing, a ring seated in said casing on the inner side of said disk and having a knife edge in engagement therewith, and a ring threaded into said casing in abutting relation to the outer side of said disk.

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