June 6, 1933. F. W. VODOZ 1,913,015

BLASTING CARTRIDGE

Filed Feb. 7, 1931

Fig. 1

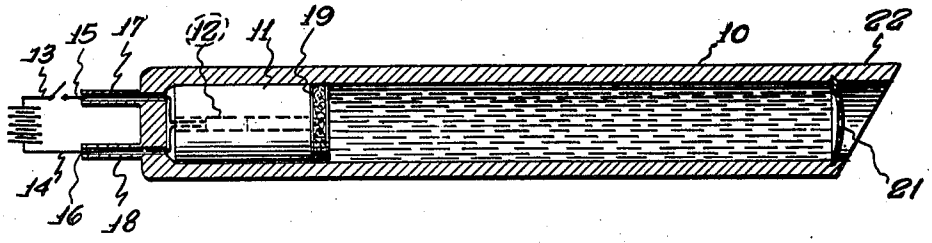



Fig. 2

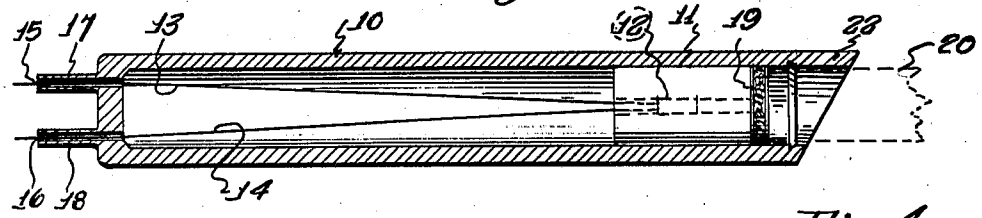



Fig. 3

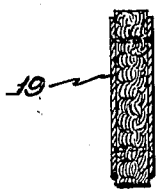



Fig. 4

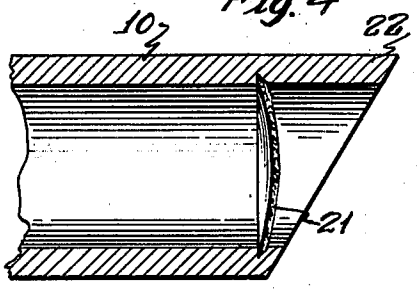
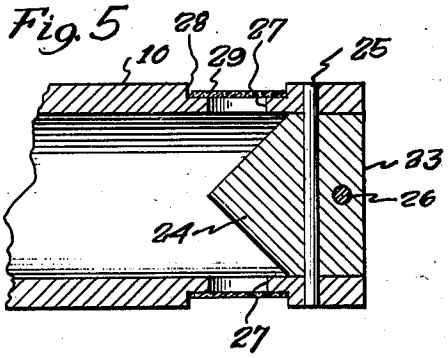



Fig. 5




Inventor
Frederick W. Vodoz
Clarence D. Poole
Attorney

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# UNITED STATES PATENT OFFICE

FREDERICK W. VODOZ, OF WILMETTE, ILLINOIS, ASSIGNOR TO GOODMAN MANUFACTURING COMPANY, OF CHICAGO, ILLINOIS, A CORPORATION OF ILLINOIS

## BLASTING CARTRIDGE

Application filed February 7, 1931. Serial No. 514,157.

This invention relates to a new and improved means of blasting and more particularly to a new and improved blasting cartridge especially adapted for use in gaseous coal mines.

Blasting in coal mines is generally carried out by the use of explosives set off by electrical fuses or detonators. The disadvantages of these explosives are numerous.

The chief disadvantage is that there is always present the danger of ignition of the mine gases by the flame of the explosion. Another disadvantage is that the explosive charge is unconfined, and due to this fact and the rapidity of the explosion the coal is unduly pulverized with a resultant waste of the fine coal.

My invention has among other objects to provide a blasting cartridge having a means for extinguishing the flame caused by the explosive charge so explosives may be used in gaseous mines and to provide such a cartridge which will confine the explosive force and permit it to be applied where desired, preferably at the rear of the drill hole, to break up the coal into large lumps and eliminate the pulverization of the coal caused by an unconfined or elongated charge.

Many attempts have been made to discover an explosive that would be safe to employ in gaseous mines. While the different grades of black blasting powder, owing to the gradual development of the full explosive force, are best adapted to breaking down coal, yet the flame that always accompanies the explosion of this powder renders it an unsafe explosive to be used in the presence of gas. In seeking to make this explosive safe, certain inert substances have been introduced into the powder, such as sulphate of magnesia, the carbonates of sodium and calcium, to reduce the activity and absorb heat from the gaseous products of the explosion. Another method was to introduce nitrates into the powder to such an extent as to render the gaseous products of the explosion as nearly as possible incombustible. No powder, however, has ben found which is absolutely without flame. Another method tried was to surround the explosive charge with water. This was found to eliminate the risks of shot fire in the presence of gas but it was difficult to confine the explosive force to have the desired breaking down effect and to prevent the pulverizing of the coal. Trouble was also experienced in igniting the charge since it was difficult to surround the explosive with water and still prevent water from seeping into the explosive. The device of my invention is provided with a flame extinguishing and pressure exerting fluid and has been arranged so as to prevent this fluid from seeping into the explosive and eliminates the possibility of unduly pulverizing the coal by confining the explosive and water in a shell or cartridge so the explosive force may be exerted through said fluid and the fluid may break down the coal, thus making it possible to confine the explosive force where desired and enable the coal to be broken down in large lumps.

Other objects of my invention will appear from time to time as this specification proceeds.

My invention may be more clearly understood with reference to the accompanying drawing wherein:

Figure 1 is a partial longitudinal sectional view of the device embodying my invention;

Figure 2 is a longitudinal sectional view of the device embodying my invention showing the method of inserting the explosive charge;

Figure 3 is an enlarged sectional view showing the details of a packing means embodied in my invention;

Figure 4 is an enlarged fragmentary sectional view of the forward portion of the device embodying my invention; and

Figure 5 is an enlarged fragmentary sectional view showing a modification of the forward end of the device embodying my invention.

Referring now in particular to the drawing, 10 indicates a shell adapted to receive an explosive charge. This shell is herein preferably shown as being tubular in form and open at one end and closed at the other with provisions in the closed end for the admission of electrical wiring for setting off the

charge. This shell may be made from any strong material which will withstand an explosive force without rupture but it is particularly desirable to make this shell from a steel of properties capable of withstanding great stresses such as a swedged molybdenum steel.

11 indicates a charge of powder. This powder is preferably contained within a container of a light water-proof material which is easily ruptured. This container may be made from any well known material such as a thin copper shell of a diameter equal to the inside diameter of the shell 10, or it may be made from suitable paper such as an impregnated or waxed paper well known to those skilled in the art. An electric squib 12 is contained within the powder charge and is connected to an electrical source of energy by means of wires 13 and 14 which are adapted to pass through apertures 15 and 16 in the closed rearward end of the shell 10. It may be noticed that the apertures 15 and 16 are provided in raised portions 17 and 18 extending rearwardly from the shell 10 to provide a surface of sufficient length to extinguish any flame within said shell which might be caused by explosion of the charge 11.

Referring now in particular to Figure 2 and the means for inserting the powder charge 11 into the shell 10, two fine wires are inserted through the apertures 15 and 16. These are connected to the ends of the wires 13 and 14. The powder 11 then is inserted in the forward end of the shell 10 and pushed in said shell while the wires 13 and 14 are kept taut. A packing member 19 is adapted to abut the forward end of the powder charge 11. This packing member may be made from any suitable material but is herein preferably shown as being made from a piece of felt of larger diameter than the bore of the shell 10 having fibre disks on each side thereof of substantially the same diameter as the bore of said shell. The powder charge 11 and packing member 19 may be pushed in the shell 10 by any suitable means; as, for instance, a wooden stick of a diameter substantially equal to the bore of the shell 10 as indicated by dotted lines at 20 in Figure 2. As the powder charge 11 and packing member 19 are pushed within the shell 10, the wires 13 and 14 are drawn through the apertures 15 and 16 until the rearward end of said powder charge substantially abuts the closed inner end of the shell 10.

A means is provided to exert a pressure against the material to be broken down upon ignition of the powder 11 and aid in extinguishing the flame caused upon the resultant explosion of said powder charge. This means may be of any pressure exerting, flame extinguishing medium but is herein preferably shown as being a fluid such as water or a compound containing water and chemicals or substances to aid in extinguishing the flame. This fluid is poured in the open end of the shell 10 on top of the packing member 19.

A closure member is provided for the forward end of the shell 10. This closure member may be made from any suitable material such as fibre or a tin or copper alloy or ordinary paper. As herein shown this closure member comprises a heavy water-proof disk 21 clinched into the end of the shell 10 so as to prevent the pressure exerting, flame extinguishing fluid from leaking out of said shell and so as to easily rupture upon the application of force to said closure member from within said shell.

The shell 10 is adapted to be inserted within a drill hole in the working face with the forward end containing the closure member 21 adjacent the inner end of the hole.

It should here be noted that a portion 22 of the shell 10 extends forwardly of the closure member 21 providing a shell having a forward end cut at a diagonal with the closure member 21. The forwardly extending portion 22 of the shell 10 should be positioned at the top of the hole to direct the pressure exerting medium forwardly and downwardly and cause a clean downward break adjacent the rear end of the hole. When the shell 10 is properly positioned in the hole it is tamped with clay to prevent its shooting out of the hole upon explosion of the powder charge 11. It may thus be seen that when electric power is provided to the wires 13 and 14 that the electric squib 12 will ignite the powder charge 11 and force the flame extinguishing fluid forwardly through the bore of the shell 10 rupturing the closure member 21 and exerting a downwardly directed force at the rear end of the drill hole to cause a clean break from the inner end of the hole to the inner end of the undercut kerf and thus break the coal down in lumps instead of pulverizing it.

Referring now in particular to Figure 5 showing a modified form of my invention, a plug 23 may be inserted within the forward end of the shell 10 in place of the closure member 21. This plug may be of any shape but is herein preferably shown as being provided with a conical inner end 24 and is held in the forward end of the shell 10 by means of pins 25 and 26. A plurality of radial apertures 27 are provided in the forward portion of the shell 10 opposite the conical portion 24 of the plug 23. An annular groove 28 surrounds the shell 10 adjacent the apertures 27 to provide a means for receiving a closure means 29 such as tape or any other well known material for closing the apertures 27 and holding a pressure exerting flame extinguishing fluid within the shell 10.

Thus upon explosion of the powder charge

11 the water or fluid within the shell 10 is forced against the conical end 24 of the plug 23 to force the fluid through the apertures 27 breaking the tape 29. Thus a radial force is exerted by the water at the rearward end of the hole for evenly distributing the force for breaking down the coal.

While I have herein shown and described one form of my invention, I do not wish to be limited to the precise details of construction or arrangement of parts herein shown and described, excepting as specificially limited in the appended claims.

I claim as my invention:

1. A blasting cartridge comprising a permanent non-rupturable shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, and a flame extinguishing medium confined within said shell between said powder charge and closure member.

2. A blasting cartridge comprising a permanent non-rupturable shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, and a flame extinguishing pressure exerting medium confined within said shell between said powder charge and closure member.

3. A blasting cartridge comprising a permanent non-rupturable shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, and a flame extinguishing pressure exerting fluid confined within said shell between said powder charge and said closure member.

4. A blasting cartridge comprising a permanent non-rupturable shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, and water confined within said shell between said powder charge and closure member for extinguishing the flame caused by the ignition of said powder and for exerting a pressure outwardly from said shell.

5. A blasting cartridge comprising a shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, a packing member within said shell and adapted to abut the forward end of said powder charge, and a flame extinguishing medium confined within said shell between said packing member and closure member.

6. A blasting cartridge comprising a shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, a packing member within said shell and adapted to abut the forward end of said powder charge, and a flame extinguishing pressure exerting medium confined within said shell between said packing member and closure member.

7. A blasting cartridge comprising a shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, a packing member within said shell and adapted to abut the forward end of said powder charge, and a flame extinguishing pressure exerting fluid confined within said shell between said powder charge and said closure member.

8. A blasting cartridge comprising a shell, a closure member, said closure member being adapted to open upon the application of pressure within said shell, a charge of powder within said shell adjacent the end opposite said closure member, a packing member within said shell and adapted to abut the forward end of said powder charge, and means confined within said shell for extinguishing the flame caused by the ignition of said powder and exerting a pressure outwardly from said shell through said closure member comprising water.

Signed at Chicago, in the county of Cook and State of Illinois, this 5th day of February 1931.

FREDERICK W. VODOZ.