

April 26, 1938.

R. J. HEITZMAN
SAFETY BLASTING PLUG

2,115,388

Filed Oct. 8, 1934

2 Sheets-Sheet 1

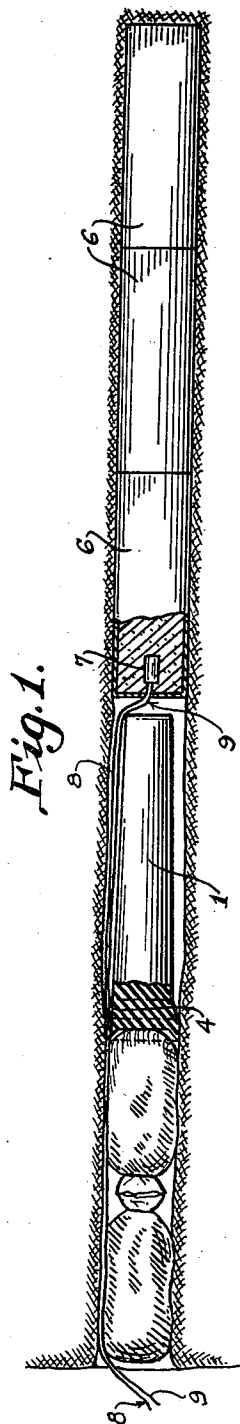


Fig. 4.

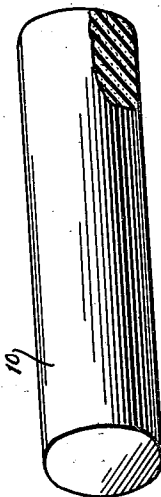


Fig. 5.

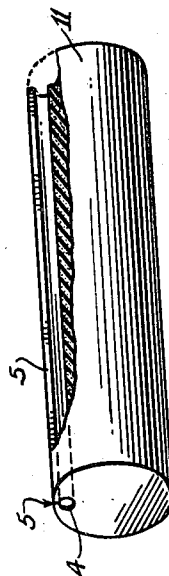


Fig. 2.

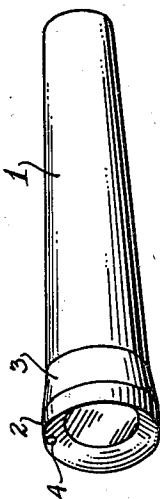
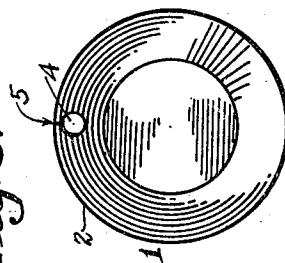


Fig. 3.



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2 Sheets-Sheet 2

Fig. 7.

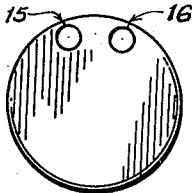


Fig. 9.

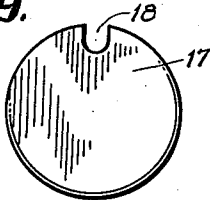


Fig. 11.

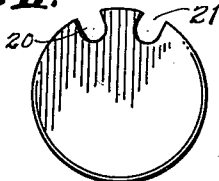


Fig. 13.

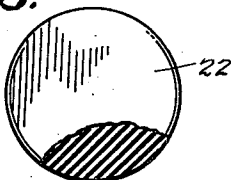


Fig. 15.

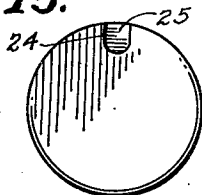


Fig. 17.

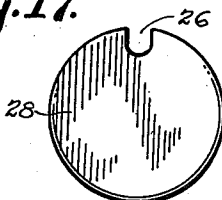


Fig. 6.

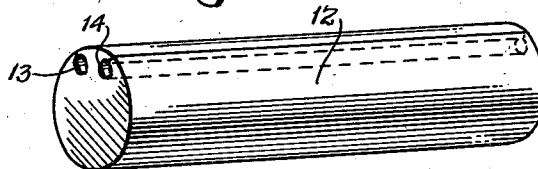


Fig. 8.

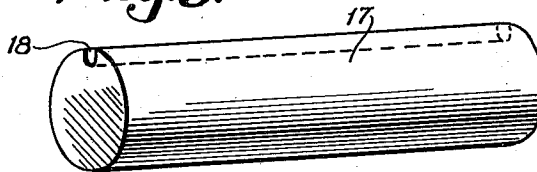


Fig. 10.

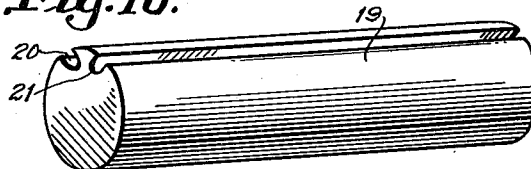


Fig. 12.

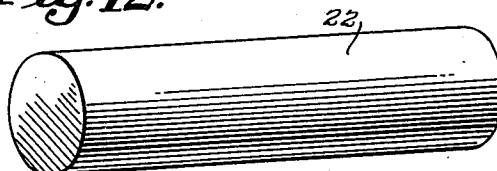


Fig. 14.

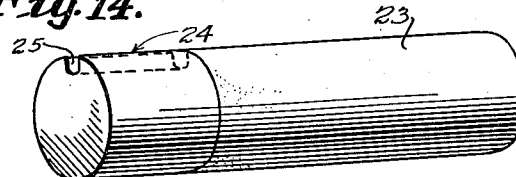
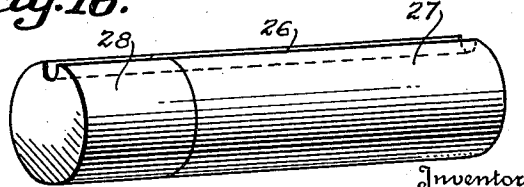


Fig. 16.



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UNITED STATES PATENT OFFICE

2,115,388

SAFETY BLASTING PLUG

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of one-fourth to William E. Ressler, Shamokin,
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Application October 8, 1934, Serial No. 747,435

4 Claims. (Cl. 102-11)

This invention relates to blasting plugs and is an improvement upon the type of blasting plug described and claimed in my Patent No. 1,896,817, granted February 7, 1933. The present improvement as well as the blasting plug forming the subject matter of said patent is particularly employed in mining and quarrying and has for its general object to increase the safety factor of such devices by avoiding those causes of misfire ordinarily attributable to short circuiting, and should a misfire occur through inherent defect in the detonating cap, the invention affords a safe means for the extraction of the detonating cap from the bore hole.

The characteristic features of the invention covered in the patent aforementioned are the absence of metal in the construction of the blasting plug and the provision of an expansible anterior portion which under the tamping pressure spreads to conform to the wall of the bore hole in a firm and gas-tight manner, the rear portion being of such nature as to be readily penetrated by an auger for the purpose of effecting the withdrawal of the plug in the event of a misfire. Since short circuiting is ordinarily caused by abrasion of one of the wires leading to the detonating cap incident to the friction of tamping, the invention of the patent safeguards the wires by providing separate bores in the plug through which the wires are separately threaded, keeping them apart from one another and away from the wall of the bore hole.

In practice however it has been found at times somewhat difficult to thread the wires through the bore holes on account of insufficient illumination in the mine or the ravelled nature of the insulation of the wire at its free ends. The present invention therefore has for its specific object the provision of lateral slots into which the wire may be pressed and retained, an operation which can be performed by the sense of feeling alone and which can be done if need be in the dark.

Another object of the invention is to make the blasting plug of such yielding material that even in the absence of any bore for receiving the wires, the same may be placed alongside the plug in customary manner as it is inserted in the bore hole and the plug will yield to the shape of the wires as it is tamped into place, without abrading them.

Other objects of the invention will appear as the following description of a number of embodiments of the invention proceeds.

In the drawings throughout the several figures

of which the same characters of reference have been employed to denote identical parts:

Figure 1 is a longitudinal section through a bore hole showing one form of my improved blasting plug in position with respect to the dynamite and the sand packing;

Figure 2 is a perspective view of the blasting plug shown in Figure 1;

Figure 3 is an end elevation;

Figure 4 is a perspective view of a cylindrical sponge rubber blasting plug;

Figure 5 is a perspective view partly in section through a cylindrical soft rubber plug having a single wire slot extending throughout the length thereof;

Figures 6 and 7 are respectively a perspective view and end elevation of a cylindrical soft blasting plug having two wire slots;

Figures 8 and 9 are similar views showing another form of the invention in which the blasting plug is of relatively hard material and provided with a single wire slot;

Figures 10 and 11 are similar views showing a plug of hard rubber or its equivalent having two lateral wire slots;

Figure 12 is a perspective view of a hard blasting plug having no provisions for the wires;

Figure 13 is an end elevation of the same;

Figures 14 and 15 are respectively a perspective view and end elevation of a composite plug having the anterior portion soft and the posterior portion hard with a single wire slot extending through the hard portion only; and

Figures 16 and 17 are similar views showing the composite plug with the wire slot extending through both the hard and soft portions.

Referring now in detail to the several figures and first adverting to that form of the invention shown in Figures 1, 2 and 3, the numeral 1 represents a plug preferably of conical form throughout its anterior portion, and having a cylindrical zone 2 at its posterior end, with an intermediate taper 3. The entire plug is preferably made of a soft compressible material such as sponge rubber which material has not only the advantage of inherent softness, but also has imprisoned air bodies which assist in cushioning the impact of the explosion. A lateral slot 4 for receiving the ignition wires is formed in the cylindrical zone and opens into the tapered portion 3. Figure 3 shows that the slot may consist of a tubular recess opening to the exterior plug by a mere slit 5 which spreads to admit the wires and then springs back into closed position so that the slot 4 completely encompasses the wires

shielding them from coming in contact with the wall of the bore hole. The posterior end of the cylindrical zone is preferably concaved to guide the tamping rod or ram so as to avoid its coming in contact with the wires at their point of emergence from the plug at which point they are close together and special precaution must be taken to prevent the insulation becoming damaged.

In practice, the sticks of dynamite 6 having been put in place in the bore hole with the detonating cap 7 embedded in the last stick and the wires 8 and 9 leading therefrom to the exterior of the bore hole, the safety plug is taken and the two wires 8 and 9 pressed through the slit 5 into the slot 4. The blasting plug is then thrust into the bore hole and slid along the wires under the pressure of the ram or tamper until its anterior end comes adjacent the final stick of dynamite. Further action of the tamper or ram causes the soft rubber to expand radially filling the bore hole and coming into intimate and sealing relation with the wall of the bore hole. The enlarged cylindrical portion of the blasting plug forms a tight seal against the wall of the bore hole preventing the escape of gases until the explosion has expended its force.

In view of the fact that the portion 1 is conical, it does not come into intimate contact with the wires until the blasting plug has been pushed entirely into place. Consequently, there is no tendency to abrade the wires against the wall of the bore hole.

If a misfire occurs it is an easy matter to insert an auger, boring into the posterior portion of the blasting plug and to draw it out without the risk of sparks which might cause an explosion.

In Figure 4 a form of the invention is shown in which the blasting plug 10 is an undifferentiated cylinder of soft material such as sponge rubber, no slots being provided for the protection of the wires. This cylinder is pushed into the bore hole with the tamper, its yielding nature causing it to conform to the wires as it is pushed in. When it is in final position, a few blows with the tamper expand it radially and retain it in place.

Figure 5 is a blasting plug 11 of similar shape and material, but in this instance a slot 4 extends longitudinally therethrough and opens in the lateral surface of the plug by means of the slit 5 which closes after the wires have been pushed in. The manner of inserting this plug is the same as in the previously described modification.

In those forms of the invention which have been described up to the present time, both wires are introduced into the same slot. Figures 6 and 7 show a further modification of the invention in which the wires are independently inserted in different slots. The cylindrical plug 12 is of soft material, having a pair of similar bores 13 and 14 extending therethrough in parallel relation and communicating with the lateral surface of the plug by means of slits 15 and 16. One of the ignition wires is pressed into each slot just before the plug is introduced in the bore hole.

Figures 8, 9, 10 and 11 are respectively perspective views and views in end elevation of two forms of plug which are a departure of those forms previously described inasmuch as they are of hard material throughout. The plug 17 shown in Figure 8 is provided with a single open groove

18 for the reception of the two ignition wires whereby when the plug is driven into place the wires are protected from being abraded against the wall of the bore hole. In this form of the invention no provision is made for sealing the plug in the gas-tight manner its sole claim to patentability being in protecting the wires. It is also characterized by being non-metallic and the posterior end is readily penetrable by an auger for removing the plug. On account of the peripheral position of the wires there is no risk of the auger boring into the wires.

The plug 19 shown in Figure 10 is similar to that shown in Figure 8 excepting that there are two longitudinal grooves 20 and 21, one for each of the ignition wires.

Figures 12 and 13 show a hard rubber plug of cylindrical shape and having no provision for safeguarding the ignition wires. It is readily removable by means of an auger without the risk of producing a spark.

Figure 14 shows a composite blasting plug having the anterior portion 23 formed of soft material such as sponge rubber and the posterior portion 24 being made of hard material such for example as hard rubber. The hard portion has an open groove 25 extending therethrough, but the soft portion is devoid of any such groove. The wires are introduced laterally into the groove 25 before the plug is pushed into the bore hole and the yielding nature of the soft portion 23 is relied upon to conform to the shape of the portion of the wires which extend from the groove 25.

Figure 16 shows a composite plug 26 having a soft anterior portion 27 and a hard posterior portion 28. In this instance both portions are provided with an open slot extending longitudinally therethrough and adapted to receive the ignition wires.

While I have in the above description defined what I believe to be a number of preferred and practical embodiments of the invention and that the details of construction as shown and described are merely by way of example and not to be construed as limiting the scope of the invention as claimed, what I claim is:

1. Safety blasting plug comprising a body having a tapering anterior portion of yielding material, and a cylindrical posterior portion of relatively large diameter having a wire receiving slot extending longitudinally therethrough and opening into the lateral surface of said plug, the posterior end of said plug being concave.

2. Safety blasting plug comprising a body of yielding rubber having a longitudinal bore extending therethrough communicating with the lateral surface of said body by means of a yielding-walled narrow slit.

3. Safety blasting plug comprising a body of yielding rubber having a longitudinal bore extending therethrough communicating with the lateral surface of said body by means of a yielding-walled slit of such normal width dimension as to retain in said bore a wire forced through said slit.

4. Safety blasting plug comprising a body of yielding rubber having a longitudinal bore extending therethrough communicating with the lateral surface of said body by means of a yielding-walled slit, said slit being of less width than the diametrical dimension of said bore whereby to retain in said bore a wire forced through said slit.

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