May 10, 1932. H. S. PIERCE ET AL 1,857,792

BLASTING CARTRIDGE

Filed Oct. 11, 1929 2 Sheets-Sheet 1

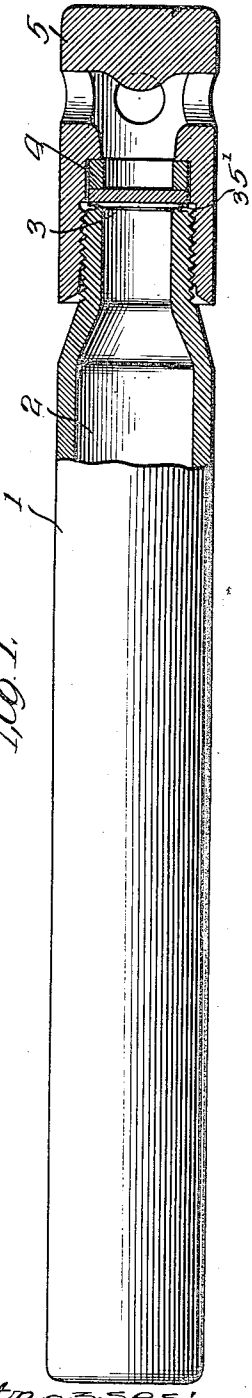

Fig. 1.

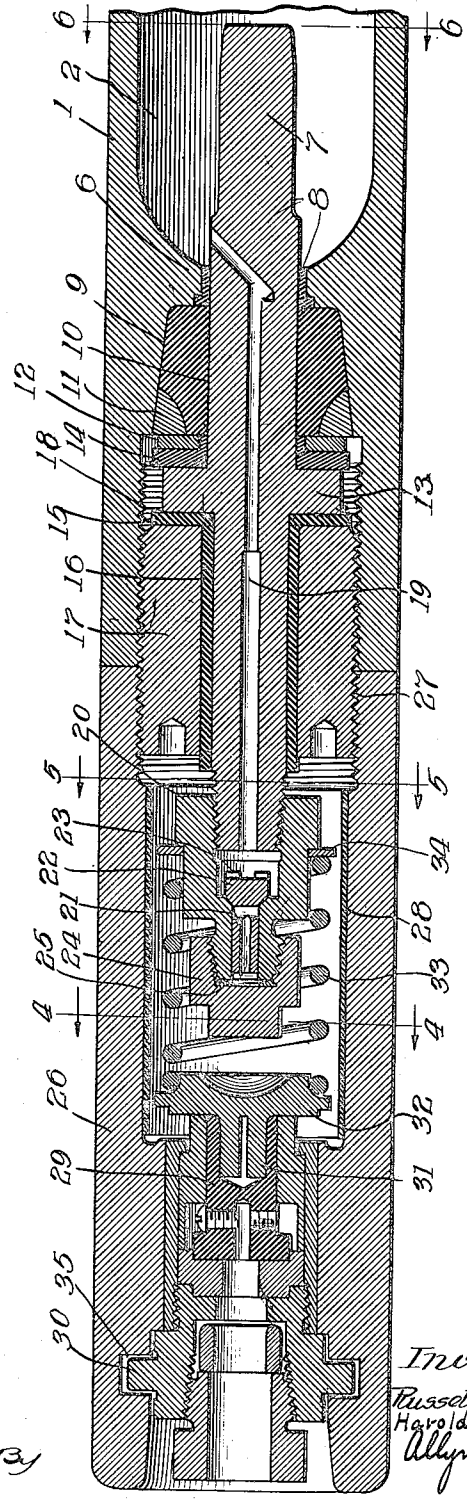

Fig. 2.

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Filed Oct. 11, 1929 2 Sheets-Sheet 2

Fig. 3.

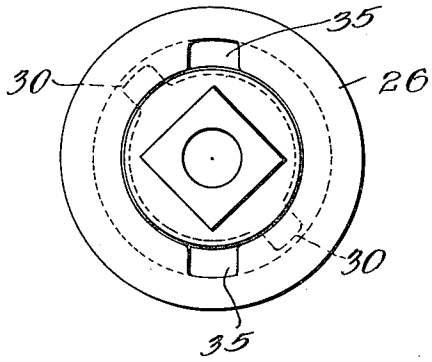


Fig. 4

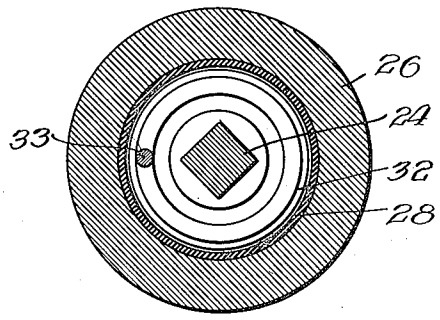


Fig. 5.

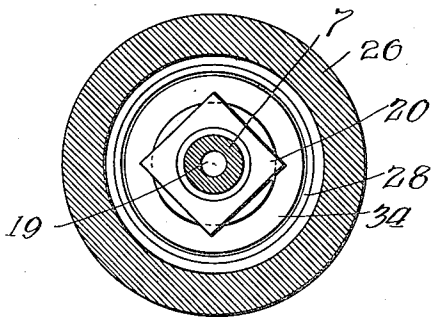


Fig. 6.

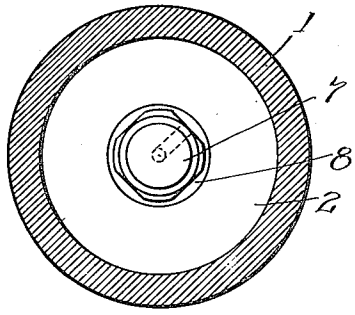


Fig. 8.

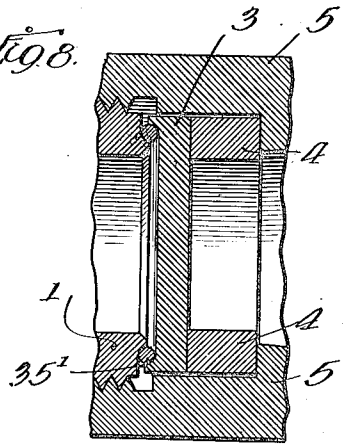
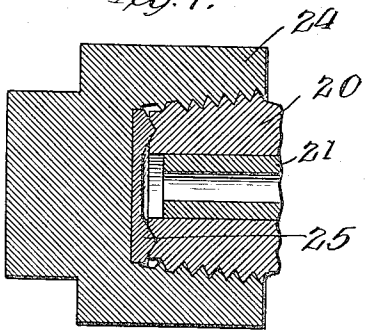


Fig. 7.



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Patented May 10, 1932 1,857,792

UNITED STATES PATENT OFFICE

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BLASTING CARTRIDGE

Application filed October 11, 1929. Serial No. 398,987.

This invention is concerned with the type of blasting cartridges which employ an expansible gas as the blasting medium and wherein the gas is expanded to produce the desired pressure by means of an electrically energizable heat producing device. In this type of cartridge it is customary to employ an electrode extending through and insulated from the casing and between which and the casing the electrically energizable heat producing device is positioned, thus providing a circuit for the passage of electricity from the electrode, through the heater and thence to the casing. It is also usual in cartridges of this type to provide a valve controlled passage through the electrode for charging the cartridge and a detachable cap by means of which a source of electricity may be conveniently connected with the electrode and casing. The cap also serves to protect the valve and electrode. The present invention is concerned with improvements in and relating to these several features.

The principal object of the invention is to provide a cartridge of greater reliability and involving less cost to manufacture and maintain in service.

Among the more specific objects of the invention is that of providing an improved form of electrode and mounting therefor.

Another object is to provide an improved form of valve mechanism for controlling the introduction of the charge into the cartridge.

A further object is to provide a cartridge embodying an improved form of connection between the cartridge and the cap.

A still further object relates to an improved form of seal between the cartridge body and the pressure responsive discharge means.

Other objects reside in the relationships of the features mentioned and in the details of construction set forth in the following description of the accompanying drawings, in which Fig. 1 is a longitudinal view of the cartridge showing the gas chamber 2 and discharge cap 5 in section.

Fig. 2 is a longitudinal view of the cartridge in section showing the valve assembly and electrode 7.

Fig. 3 is an axial end view of the cartridge showing the cap 26 and lugs 30 secured in bayonet slots 35.

Fig. 4 is a cross sectional view on line 4—4 of Fig. 2.

Fig. 5 is a cross sectional view on line 5—5 of Fig. 2 showing the electrode 7, valve body 20, and disc 34.

Fig. 6 is a cross sectional view on line 6—6 of Fig. 2 showing the electrode 7 and insulating bushing 8.

Fig. 7 is an enlarged longitudinal sectional view of the valve body 20 sealing disc 25 and cap 24.

Fig. 8 is an enlarged longitudinal sectional view of the rupturable disc 3, sealing ring 35^1 and body 1.

The assembled cartridge as illustrated in Figure 1 comprises an elongated cylindrical shell 1 having an internal gas chamber 2, the outlet of which is adapted to be sealed by means of a pressure responsive rupturable disc 3. A shear ring 4 formed of hard steel is employed to back up the rupturable disc and this ring is securely held in place by means of the discharge cap 5 which has threaded engagement with the discharge end of the cartridge.

The end of gas chamber 2 remote from the discharge opening is defined by a transverse wall which is centrally apertured to receive an insulating bushing 8 and an electrode 7. The opposite side of wall 6 is formed with a substantially conical recess 9 designed to receive a suitable insulating and packing material 10. A split compressing ring 11 is employed to hold the packing in position and this ring is in turn backed up by a crowding disc 12 and a flange 13 formed on the electrode. In order to insure against short circuiting of the electrode and shell body, an insulating disc 14 is interposed between the flange 13 and the metallic crowding disc 12. The other face of the electrode flange 13 is provided with an insulating disc 15 which, together with an insulating sleeve 16 surrounding the electrode, serves to completely insulate the electrode from the metal nut 17 which engages the thread 17 formed on the interior of the shell body. It will be understood that nut 17 functions as a means to

force the electrode in an axial direction toward the gas chamber and thus provide an effective seal between the electrode and shell body.

The electrode 7 is provided with an axial passage 19 extending therethrough and communicating with the interior of the gas chamber for the purpose of permitting the introduction of a gas charge into the chamber. The outer end of the electrode is engaged by a valve body 20 which is provided with an internal chamber and communicating axial passage, within which is located a pressure responsive valve 21. It will be noted that the valve 21 comprises a cylindrical portion which fits the axial bore of the valve body and an enlarged base portion 22 having a conical seat which serves to close the entrance to the chamber within the valve body. Suitable lugs 23 formed on the bottom surface of the enlarged portion 22 of the valve serve to prevent the sealing of the end of gas passage 19 in the electrode when the valve is moved axially by the pressure of incoming gas. The cylindrical portion of the valve stem is provided with communicating axial and transverse bores so arranged that gas will escape into the chamber in the valve body only when the valve has been moved axially by the force of the gas being charged into the shell. When the charging operation has been completed and the charging pressure removed from the valve, it will be apparent that the back pressure from the gas chamber acting on the enlarged portion 22 of the valve will serve to move it in the opposite direction to bring the cooperating conical surfaces of the valve and valve body into engagement and thus provide an effective seal against the escape of gas from the chamber. In order to further insure against the escape of gas from the cartridge, a cap 24 is provided which is adapted to have threaded engagement with the end of the valve body in which the charge aperture is located. The cap is provided with a sealing disc 25 formed of a suitable soft metal, such, for example, as copper. The form of this sealing disc is clearly shown in detail in Figure 7.

In order to protect the valve mechanism and the exposed portion of the electrode, a substantially cylindrical cap is provided which is designed to be rigidly secured to the end of the cartridge. For this purpose the nut 17 is so proportioned as to extend a substantial distance beyond the end of the shell body 1 and thus forms a support for the cap 26 which may be threaded thereon as indicated at 27. The interior of cap 26 is provided with an insulating liner 28 in order to prevent possible short circuits between the cap and the electrode and its associated parts. The free end of cap 26 is designed to receive a detachable plug consisting of relatively insulated portions 29 and 30. The two leads from a source of electricity may be secured to the members 29 and 30 respectively in order to conduct current to the electrode and shell body respectively. The member 30, of course, is in direct electrical contact with the metallic cap 26 which in turn is in electrical contact with the shell body. The member 29 is provided with a socket designed to receive a plug 31 formed on contact disc 32 and in order to complete the circuit between the disc 32 and the electrode a metallic spring 33 extends between and contacts with the metallic disc 34 associated with the valve body 24 and disc 32. The particular form of the detachable plug forms no part of the present invention except insofar as it relates to the general assembly herein described. It will be appreciated that the function of this plug is simply to provide a means for conducting electricity to the electrode and shell body respectively. This plug may be detachably associated with the end of the cap 26 by means of the lugs 30 and suitable bayonet slots 35 as indicated in Figures 2 and 3.

Another feature of the present invention is the construction and arrangement of the rupturable discharge disc 3 and the manner in which it is sealed against the end of the cartridge body. Referring particularly to Figure 8 it will be noted that the end of the body 1 and the discharge disc 3 are provided with slightly spaced inclined surfaces between which a sealing ring 35′ is positioned. This ring may be formed of a suitable sealing material such as copper. By virtue of this construction a very effective seal is provided between the disc 3 and the end of the cartridge.

We claim:

1. A blasting cartridge comprising a substantially cylindrical metallic body having an internal gas chamber formed therein, one end of said body having a substantially cylindrical pocket formed therein, a transverse wall separating said pocket and gas chamber, an electrode extending thru an aperture in said wall and insulated therefrom, a flange on said electrode within said pocket, insulating and packing material interposed between said flange and the adjacent surface of said wall, a nut surrounding said electrode and having threaded connection with the annular wall of said pocket, an insulating sleeve between said nut and electrode, an insulating disc between said flange and the adjacent end of said nut, and a cap mounted on said nut.

2. A blasting cartridge comprising a metallic body having an internal gas chamber formed therein, an electrode extending thru an end of said body and into said chamber, an internally threaded pocket in the end of said body surrounding said electrode, an externally threaded nut engaging in said pocket and surrounding said electrode for clamping the same in place, said nut extending beyond

the end of said body, and a cap engaging the exposed portion of said nut.

3. A blasting cartridge comprising a substantially cylindrical metallic body having an internal gas chamber formed therein, one end of said body having a substantially cylindrical pocket formed therein, a transverse wall separating said pocket and gas chamber, an electrode extending through an aperture in said wall and insulated therefrom, said wall having a tapered packing recess formed therein, a packing and insulating material disposed in said recess and surrounding said electrode, a flange on said electrode adjacent the open end of said recess and adapted to cooperate with said packing to compress the same within said recess and around the electrode, a nut surrounding said electrode on the other side of said flange and insulated therefrom, said nut having threaded connection with the interior of said pocket and adapted to act on said flange to compress said packing, a portion of said nut extending beyond the end of said body and a cap having detachable connection with said portion.

4. A blasting cartridge comprising a metallic body having a gas chamber formed therein, an electrode extending through a wall of said body and insulated therefrom and having an end exposed to the pressure within said chamber, a flange on said electrode outside of said chamber, and an abutment member having adjustable connection with said body and adapted to cooperate with said flange.

5. A blasting cartridge comprising a substantially cylindrical metallic body having a gas chamber formed therein, one end of said body having a substantially cylindrical threaded pocket formed therein, a transverse wall separating said pocket and chamber, an electrode extending through an aperture in said wall and insulated therefrom, a flange on said electrode within said pocket, and a thrust receiving member associated with said electrode and flange and having threaded connection with the interior of said pocket.

6. A blasting cartridge comprisng a metallic body having a gas chamber formed therein, an electrode extending through a wall of said body and insulated therefrom, said electrode having a gas passage therein, a valve body secured to the end of said electrode and having an axial bore in alignment with said passage, a valve slidably mounted in said bore, and a cap adjustably connected with the end of said valve body and adapted to seal the end of said bore.

7. The combination with a blasting cartridge having a discharge opening, and a sealing surface surrounding said opening, of a member adapted to seal said opening, the aforesaid surface and the adjacent surface of said member having concentrically arranged inclined sealing surfaces, and a sealing element interposed between said inclined surfaces.

8. A blasting cartridge substantially as set forth in claim 10, further characterized in that said sealing element is a soft metal ring of circular cross section.

Signed at Indianapolis, Indiana, this 7th day of October, 1929.

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