Oct. 20, 1936. W. NOBLE 2,058,097

MATERIAL BREAKING APPARATUS

Filed Feb. 28, 1934

Fig. 1.

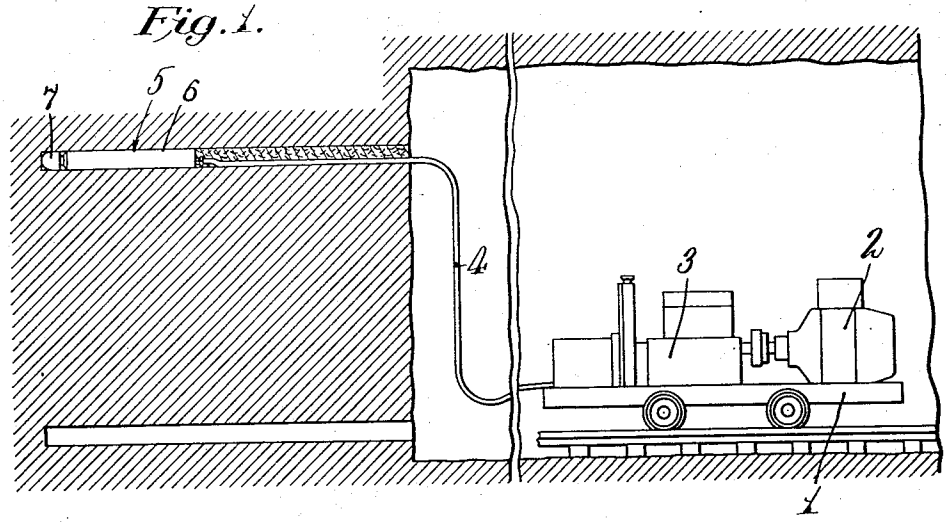


Fig. 2.

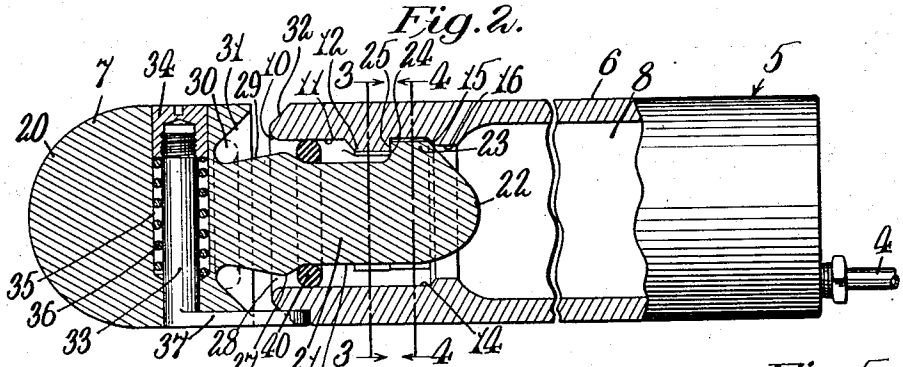


Fig. 3.

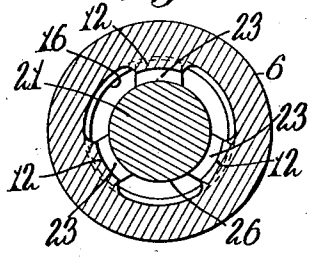


Fig. 4.

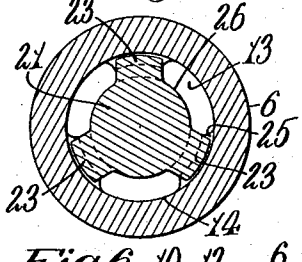


Fig. 5.

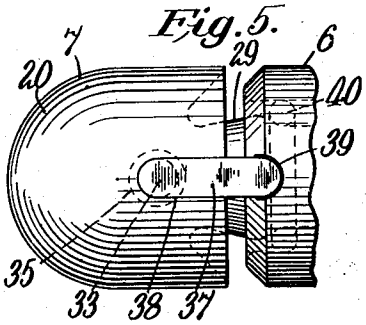
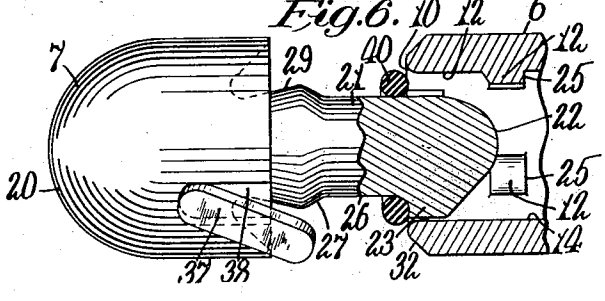


Fig. 6.



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UNITED STATES PATENT OFFICE

2,058,097

MATERIAL BREAKING APPARATUS

Warren Noble, Michigan City, Ind., assignor, by mesne assignments, to Safety Mining Company, Chicago, Ill., a corporation of Illinois

Application February 28, 1934, Serial No. 713,337

20 Claims. (Cl. 102—6)

My invention relates to material-breaking apparatus and more particularly to an improved apparatus for storing and releasing a pressure effective for the breaking down of coal or other material by mechanical means and without combustion.

From one aspect my invention comprises the employment of an extrudable closure member. A preferred embodiment may be a doughnut shaped ring, but obviously an extrudable bell-shaped, or other shaped obturator member may be employed. From another aspect it comprises the employment of an annular closure member having a sealing action and a holding action at both its inner and outer edges. From a further aspect it comprises the provision of a reusable, resilient closure member. From still another aspect it comprises the provision of a closure member cooperating with concentric walls leading to a fixed relatively radial, substantially unobstructed discharge passage. Other aspects of the invention will hereinafter appear and be pointed out in the appended claims.

An object of this invention is to provide an improved material breaking apparatus. Another object is to provide an improved material breaking apparatus adapted to produce an effective breaking pressure by mechanical means without the use of explosives or combustion. A further object is to provide an improved blasting or air-breaking shell of a type adapted to release its breaking pressure by improved mechanism. Still another object is to provide an improved air shell having improved means for releasing the pressure therein when a predetermined pressure in the shell is attained and permitting reuse of the releasing means. Yet another object is to provide an improved valve means for air-breaking shells. These and other objects and advantages of the invention will hereinafter more fully appear.

In the accompanying drawing there is shown for purposes of illustration one form which the invention may assume in practice.

In the drawing,

Fig. 1 is an elevational view showing the illustrated form of the improved breaking apparatus in position in the material to be broken.

Fig. 2 is a central longitudinal vertical sectional view, with some parts shown in elevation, through the improved air shell.

Fig. 3 is a transverse section on the line 3—3, and

Fig. 4 is a transverse section on the line 4—4, of Fig. 2.

Fig. 5 is a fragmentary view, in elevation, of the discharge end, with the cartridge shell turned through an angle of 90° from the position of Fig. 2.

Fig. 6 is a fragmentary view partially in elevation and partially in section showing the parts of the shell in partially separated position.

Referring to the drawing and first to Fig. 1, it will be noted that a portable mine car compressor 1 has a motor 2 which drives a high pressure compressor 3 and supplies pressure to a pipe line 4 which leads to an air shell generally designated 5. This air shell comprises generally two parts respectively designated 6 and 7, the former constituting the shell body and the latter a removable end therefor.

The body 6 provides a chamber 8 in which a relatively high pressure is adapted to be built up by the operation of the compressor 3; and means is provided, in conjunction with the member 7, for retaining the pressure until a desired maximum has been reached and for then suddenly releasing the pressure and allowing the relatively large quantity of stored air at high pressure to be discharged and to act upon the coal or other material to be broken down. It will be noted that the shell body 6 has an open end 10 and inwardly from said open end there is provided a smooth-walled portion, herein of uniform diameter, 11, followed by a series of inwardly directed lugs 12 arranged in a spaced series around the inner wall of the chamber and having between them a series of flow spaces 13 of substantial area. Inwardly of the lugs 12 is another annular space 14, herein of like diameter with the bore 11, and inwardly of the space 14 is a shoulder 15 surrounding a bore 16 of slightly smaller diameter than the bore 11.

The closure member 7 comprises a head portion 20 with which is connected a projecting part of reduced diameter 21. At its inner end the portion 21 is rounded as at 22 to promote air flow and is provided with a series, equal in number with the lugs 12, of radially projecting locking lugs 23, these having surfaces 24 adapted to engage correspondingly shaped oppositely facing surfaces 25 upon the lugs 12. Between the head 20 and the lugs is a smooth surfaced cylindrical portion 26 terminating at its outer end in an outwardly expanding conical surface 27 which approaches the surface 11 to provide a restricted annular space 28 through which fluid is discharged when the contents of the shell are released. Forwardly of the point of maximum diameter on the enlarged portion 27 there is a tapering portion 29 which forms the inner side of an an-

nular groove 30 whose outer wall is inclined as at 31 to cooperate with an inclined wall 32 adjacent the outer surface of the end of the body 6 to provide an annular discharge passage for the fluid to be released from the cartridge directed, when the shell is positioned in a hole, in a direction making an acute angle with a line extending toward the mouth of the hole. For the purpose of locking the head 7 to the body 6, a releasable latch is provided. Herein this is shown as in the form of a radially extending pivot portion 33 having a head element 34 threaded to the latter and movably mounted in a transverse chamber 35 and pressed in one direction by the action of a spring 36 upon the head 34. The pin member 33 has a catch 37 receivable in alined recesses 38 on the head and 39 of the shell body, when the lugs 23 and 12 are fully engaged. In a preferred form the surfaces 24 and 25 may be so related to the surface 15 that the head may be locked, in a manner similar to that of a quick opening breech block, with the body of the shell.

Sealing or valve means in the form of an obturator ring 40 is arranged in the annular space between the surfaces 11 and 26, and for the release of the air pressure it is necessary that the ring 40 be forced through the smaller annular space lying between the outermost portion of the inclined surface 27 and the surface 11. It is evident that as pressure is built up in the chamber 8, it will pass through the spaces 13 and force the ring 40 into tighter and tighter sealing engagement with the surfaces 11 and 27 until finally a pressure is built up sufficient to deform the ring to such an extent that it can be forced through the annular space 28. When this occurs, the ring will immediately pass down along the tapering surface 29 to the dotted line position and there will be provided a free passage for the generally radial discharge of the breaking pressure.

It will be observed that I have provided an air shell of simple and rugged construction, one of a design which permits the making of cartridges of different capacities merely by increasing the length thereof without in any way affecting the applicability of a single type and construction of head or closure mechanism to the different lengths of shell. It will further be noted that a relatively large quantity of air may be stored in the shell by reason of the fact that the major portion of the interior of the latter is entirely clear for occupancy by the charge of air. It will be noted, moreover, that the head is very readily releasable and replaceable, that it is of rugged construction, that it is of a type which is adapted to be locked securely in place, with an obturator member or ring which may be made of rubber of suitable composition and treatment to attain any desired release pressure, particularly when the form and area of the restricted discharge passage is suitably selected, and which may be used again and again.

While there is in this application specifically described one form which the invention may assume in practice, it will be understood that this form of the same is shown for purposes of illustration, and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim is:

1. In a blasting cartridge, a casing adapted to receive a charge of pressure fluid, and means for releasing the pressure from the casing when a predetermined blasting pressure is attained, comprising means secured to the casing providing an annular discharge space and a releasable obturator ring free with respect to said casing and space-providing-means for sealing said space.

2. In a blasting cartridge, a casing adapted to receive a charge of pressure fluid, and means for releasing the pressure from the casing when a predetermined blasting pressure is attained comprising means secured to said casing providing an annular discharge space and an extrudable obturator ring adapted to be extruded bodily through said space to release the charge while said space-providing-means remains secured to said casing.

3. In a blasting cartridge, a casing adapted to receive a charge of pressure fluid, and means for releasing the pressure from the casing when a predetermined blasting pressure is attained, comprising a deformable, indestructible obturator ring.

4. In a blasting cartridge, a casing adapted to receive a charge of pressure fluid, and comprising a hollow body, a quick-detachable end releasable by a fractional turn, and a deformable, indestructible seal free with respect to said casing body and detachable end and cooperating with both said casing body and said end for maintaining the charge in said casing and for releasing the charge.

5. In a blasting cartridge, a casing for storing a charge of pressure fluid, and means secured to said casing providing a circular seat surface, and a deformable sealing member cooperating with said seat surface and extrudable past said surface upon release of the charge while said seat-providing-means remains secured to said casing.

6. In a blasting cartridge, a casing adapted to receive a charge of pressure fluid, and having an annular release opening, and means for releasing the pressure from said casing through said opening when a predetermined pressure is attained within said casing, comprising an annular deformable closure means seating inwardly within said casing, normally maintaining said opening closed and adapted to be forced bodily through said opening past its seat into released position by said predetermined pressure.

7. In a blasting cartridge, a container for receiving a blasting charge, and discharge means embodied within one end of the cartridge and including an annular opening through which the blast is discharged, and a deformable valve ring closing said opening and adapted to be extruded bodily through said opening when a predetermined blasting pressure is attained within said container.

8. In a blasting cartridge, a container for receiving a blasting charge, and discharge means embodied within one end of the cartridge and including an annular opening through which the blast is discharged, and a deformable valve ring seating inwardly within said container for closing said opening and adapted to be extruded bodily through said opening past its seat when a predetermined blasting pressure is attained within said container, said valve ring being of substantially greater cross sectional area than the area of said discharge opening and adapted to change its shape upon extrusion thereof bodily through said opening.

9. In a blasting cartridge, a container for receiving a blasting charge, and discharge means embodied within one end of the cartridge and including an annular opening through which the

blast is discharged, and a rubber valve ring closing said opening and adapted to be extruded bodily through said opening when a predetermined blasting pressure is attained within said container.

10. In a blasting cartridge, a container for receiving a blasting charge, and discharge means embodied within one end of the cartridge and including an annular opening through which the blast is discharged, and a rubber valve ring seating inwardly within said container for closing said opening and adapted to be extruded bodily through said opening past its seat when a predetermined blasting pressure is attained within said container, said valve ring being of substantially greater area in radial section than the area of said discharge opening and adapted to change its shape upon extrusion thereof bodily through said opening.

11. In a blasting cartridge, a container for receiving a blasting charge, and discharge means for said container comprising means secured within one end of the cartridge providing an annular seat surrounded by an annular discharge space, and a deformable obturator ring seated internally in said seat and closing said annular space, said ring adapted to be extruded bodily through said space past its seat when a predetermined blasting pressure is attained within said container and while said seat-providing-means remains secured to said container.

12. In a blasting cartridge, a container for receiving a blasting charge, and discharge means embodied within one end of the cartridge for releasing the blast comprising means secured to said container providing an annular discharge space through which the blast is discharged, and a deformable obturator ring closing said space, said ring adapted to be extruded bodily through said space to release the blast when a predetermined blasting pressure is attained in said container and while said space-providing-means remains secured to said container.

13. In a blasting cartridge, a container for receiving a blasting charge and having an end discharge orifice, an end cap secured to said container and having a projection insertable within said orifice and of less cross sectional area than said orifice to provide an internal annular seat and an annular discharge space surrounding said seat, and an annular rubber ring seating internally on said seat and closing said annular discharge space, said ring adapted to be extruded bodily through said annular discharge space past said seat when a predetermined blasting pressure is attained within said container while said seat-providing-means remains secured to said container.

14. In a blasting cartridge, a container for receiving a blasting charge and having an end discharge orifice, an end cap having a projection insertable within said orifice and of less cross sectional area than said orifice to provide an internal annular seat, and an annular discharge space surrounding said seat and an annular rubber ring seating internally on said seat and closing said annular discharge space, said ring adapted to be extruded bodily through said annular discharge space past said seat when a predetermined blasting pressure is attained within said container and said cap having an annular recess outwardly beyond said seat for receiving said ring when the latter is extruded bodily through said annular discharge space.

15. In a blasting cartridge, a container for receiving a blasting charge and having an end discharge orifice, an end cap having a projection insertable within said orifice and of less cross sectional area than said orifice to provide an internal annular seat, an annular discharge space surrounding said seat and an annular rubber ring seating internally on said seat and closing said annular discharge space, said ring adapted to be extruded bodily through said annular discharge space past said seat when a predetermined blasting pressure is attained within said container, and cooperating surfaces on said cap and container for directing the blast discharge outwardly through said orifice in an inclined rearward direction.

16. In a blasting cartridge, a container for receiving a blasting charge and having an end discharge opening, a discharge cap for said container cooperating with the latter to provide a discharge opening for the blasting charge and having a portion projecting within the container discharge opening, and a quick detachable locking connection between said cap and container within the discharge opening whereby said cap may be firmly locked in place upon insertion of said projecting portion within said discharge opening and readily released.

17. In a blasting cartridge, a container for receiving a blasting charge and having an end discharge opening, a discharge cap for said container cooperating with the latter and having a portion projecting within the container discharge opening to provide an annular discharge opening for the blasting charge, and a quick detachable bayonet lock within the discharge opening between said cap and container whereby said cap may be firmly locked in place upon insertion of said projecting portion within said discharge opening and readily released.

18. In a blasting cartridge, a shell body for receiving a blasting charge, a shell head, means for securing said body and head together in assembled relation, and means seating against the shell head and the shell body nearer the outer end of the head than said securing means for sealing the charge in said shell body and maintained in sealing position by the pressure of the charge.

19. In a blasting cartridge, a casing adapted to receive a charge of pressure fluid and comprising a hollow body having an end discharge opening, a quick detachable end releasable by a fractional turn and including a locking portion projecting within the discharge opening into engagement with cooperating locking means therein and cooperating with the body to provide an annular discharge space, and a releasable seal for sealing said discharge space for maintaining the charge in said casing and for releasing the charge when a predetermined blasting pressure is attained.

20. In a blasting cartridge, a container for receiving a blasting charge and having an end discharge orifice, an end cap secured to the container within said orifice and forming with the wall of said orifice a passage through which the blasting charge flows, and a sealing member seating within the passage and adapted to be extruded bodily from the same when a predetermined blasting pressure is attained within said container, said cap having a recess outwardly beyond said passage for receiving said sealing member when the latter is extruded bodily from said passage.

WARREN NOBLE.

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CERTIFICATE OF CORRECTION.

Patent No. 2,058,097. October 20, 1936

WARREN NOBLE.

It is hereby certified that error appears in the printed specification of the above numbered patent requiring correction as follows: Page 1, first column, line 10-11, for the hyphenated word "bell-shaped" read ball-shaped page 3, second column, line 14, claim 15, for "discharge" read discharged; and that the said Letters Patent should be read with these corrections ther that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of December, A. D. 1936.

Henry Van Arsdale

(Seal) Acting Commissioner of Patents