

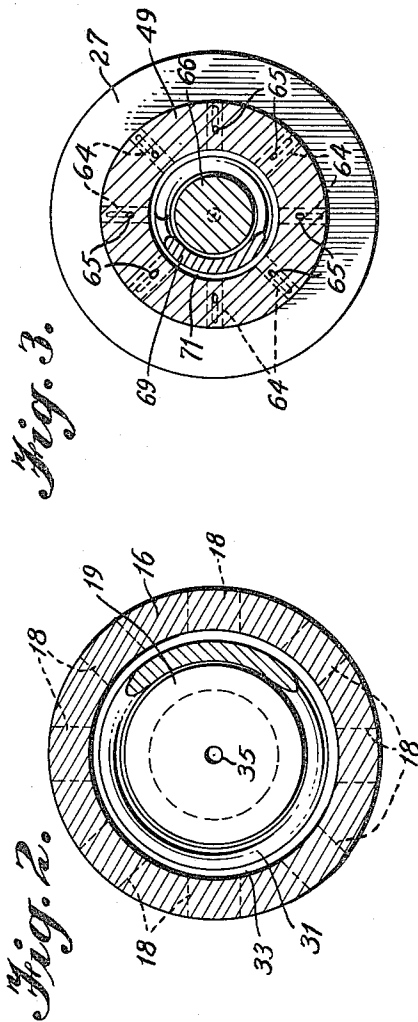
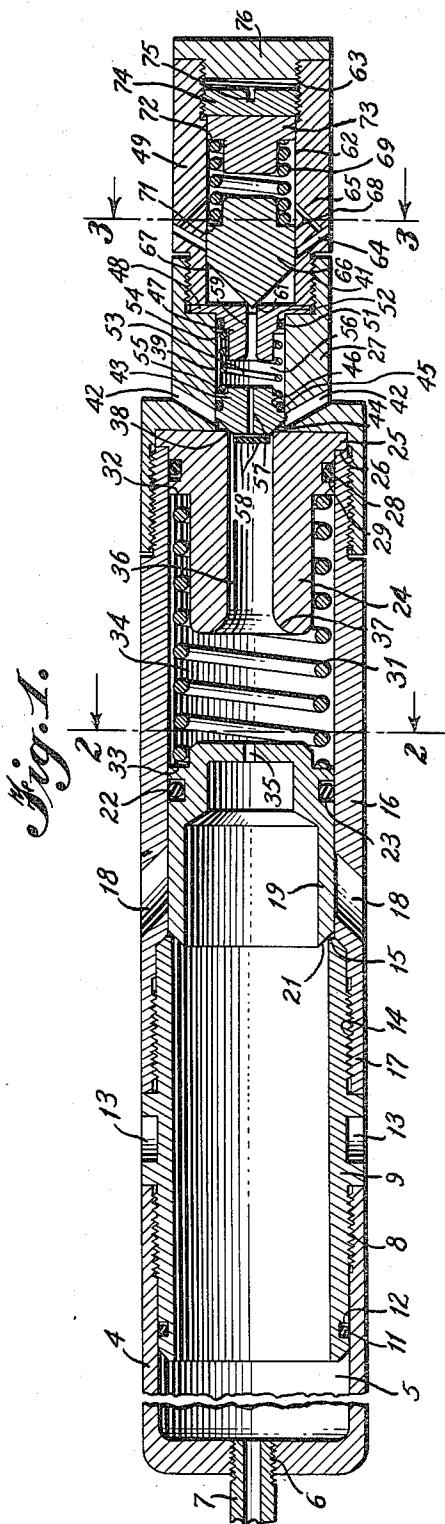
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MATERIAL BREAKING CARTRIDGE

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MATERIAL BREAKING CARTRIDGE

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This invention relates to new and useful improvements in material breaking cartridges of the type employing a high pressure gas as the work performing medium.

Cartridges employing a highly compressed charge of air or other gases for breaking down coal in mines and for other similar operations are well-known and have been widely used in recent years. Such cartridges may be precharged with a liquefied gas or with a solid which will produce a large volume of gas when heated or burned, or they may be charged with a highly compressed gas after they are positioned for operation. Regardless of the manner in which the cartridge receives its charge, however, it is of primary importance that the charge be quickly and completely released upon operation of the cartridge and that the cartridge may be easily and rapidly reconditioned for subsequent use.

The primary object of this invention is to provide a compressed gas material breaking cartridge from which the material breaking charge can be quickly and completely released and which automatically will be reconditioned for subsequent, repeated use.

A further important object of the invention is to provide a compressed gas material breaking cartridge having an automatic release valve mechanism, located entirely in the discharge end of the cartridge, which will operate at the desired work performing pressure and will immediately thereafter recondition itself for subsequent use.

Another important object of the invention is to provide a material breaking cartridge having an automatic release valve mechanism which may be readily adjusted to operate when the pressure of the gaseous charge in the cartridge has been increased to a predetermined value and which will recondition itself for a subsequent operation immediately after the charge is released.

Another important object of the invention is to provide a compressed gas material breaking cartridge, the discharge from which is controlled by an automatic release valve mechanism, located entirely in the discharge end of the cartridge, having a resiliently applied force acting thereon which may be readily adjusted to effect operation of the cartridge at a preselected pressure and which will recondition the valve mechanism for a subsequent operation after each use.

A still further object of the invention is to provide a compressed gas material breaking cartridge having a charge releasing valve mechanism located entirely in its discharge end portion and operative to effect discharge of the gas when the pressure of the charge exceeds the force exerted by a spring element which forms a part of the valve mechanism, the valve mechanism being automatically returned to its initial condition, after each discharge, to reset the cartridge for a subsequent operation.

Other objects and advantages of the invention will be apparent during the course of the following description.

In the accompanying drawing forming a part of this specification and in which like reference characters are employed to designate like parts throughout the same,

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Figure 1 is a longitudinal sectional view of a material breaking cartridge embodying the invention,

Figure 2 is a transverse sectional view taken on line 2—2 of Fig. 1, and

Figure 3 is a transverse sectional view taken on line 3—3 of Fig. 1.

In the drawing, wherein for the purpose of illustration is shown a preferred embodiment of the invention, and first particularly referring to Fig. 1, reference character 4 designates a cartridge body having a compressed gas charge receiving chamber 5. One end of the cartridge body 4 is provided with an internally threaded aperture 6 for connection with a length of tubing 7, or the like, through which a charge of compressed air, or other gas, is introduced into the chamber 5.

The threaded aperture 6 and tubing 7 comprise only one of several well-known methods of providing a charge of compressed gas in the chamber 5, and it is to be understood that the invention is not to be limited to the particular means disclosed. It is contemplated that the invention, also, may be used with equal efficiency when the charge of compressed gas is introduced into the chamber 5 as a liquefied gas or a decomposable solid.

The end portion of the body member 4 opposite the aperture 6 is internally threaded at 8 for connection with an adapter member 9. Sealing between the opposed surfaces of the cartridge body 4 and adapter member 9 is provided by the O-ring 11 which is seated in groove 12 at the inner end portion of the adapter member. The central portion of the adapter member 9 is provided with two or more indentations 13 in its outer surface for co-operation with a spanner wrench which may be used in assembling and disassembling the threadedly connected parts. The outer end portion of the adapter member 9 is externally threaded at 14 and is formed with an end edge to be used as an annular main valve seat 15.

A discharge section 16 is internally threaded at its inner end portion 17 for connection with the outer end of the adapter 9 and is provided with a circumferentially aligned row of discharge or release ports 18 which are positioned closely adjacent the valve seat 15 and are of sufficient number and total cross-sectional area, as illustrated in Fig. 2, to effect rapid release of the gas from the cartridge chamber 5. The discharge section 16 is of tubular construction and has an inner diameter that is slightly greater than that of the annular valve seat 15.

A piston type main valve 19 is positioned in the discharge section 16 for longitudinal movement between its seated and fully opened positions. The valve 19 is of hollow cylindrical construction and has an open inner end and a substantially closed outer end. The open inner end of the valve is beveled at its periphery to provide a seating surface 21 for engagement with the valve seat 15. The closed outer end portion of the valve 19 has an O-ring 22 positioned in the circumferential groove 23 to provide a seal between the valve and the inner surface of the discharge section 16. The valve 19, therefore, at all times seals the discharge ports 18 from the interior of the discharge section 16 and, when the valve is in its closed position, seals the discharge ports 18 from the charge release chamber 5.

Positioned in the outer end of the discharge section 16 is a pilot valve seat adapter 24 having a radial flange 25 that is rigidly clamped against the annular end surface 26 of the discharge section by the venting extension 27 which is threadedly connected to the outer end of the discharge section. Sealing between the adapter 24 and the inner surface of the discharge section 16 is provided by an O-ring 28 seated in the circumferential groove 29 formed in the outer surface of the adapter 24. Positioned between the main valve 19 and the adapter 24 is a spring 31 having its opposite end por-

tions seated against radial surfaces 32 and 33 of the adapter member 24 and valve 19, respectively, to urge the valve toward its seat 15.

Formed within the discharge section 16 and between the main valve 19 and adapter 24, is a main control chamber 34 which is in communication with the charge release chamber 5 through an aperture 35 in the closed outer end of the main valve 19. Extending axially through the adapter member 24 is a passageway 36 of substantially greater diameter than the aperture 35 in the main valve 19. The inner end of the passageway 36 is rounded at 37 to facilitate flow of gas into the passageway and the outer end edge of the passageway is shaped to provide an annular pilot valve seat 38.

The venting extension 27 extends axially outwardly from the pilot valve seat adapter 24 and is provided with a cylindrical bore portion 39 in axial alignment with the passageway 36 of said adapter which is of greater diameter than the passageway 36. The remainder of the bore of the extension 27 is enlarged to form a shoulder and is internally threaded at 41. Main venting ports 42 extend outwardly in a generally radial direction from the enlarged bore portion at points located adjacent the pilot valve seat adapter 24. These main venting ports 42 are of sufficient number and total cross-sectional area to effect rapid release of the gas from the main control chamber 34.

A plug type pilot valve 43 is positioned in the bore portion 39 of the venting extension 27 for longitudinal movement between its seated and fully opened positions. The inner end portion of the pilot valve 43 is tapered to provide a seating surface 44 for engagement with the pilot valve seat 38. The outer end portion of the pilot valve 43 has a packing O-ring 45 positioned in the circumferential groove 46 to provide a seal between this valve and the bore portion 39 of the venting extension 27 at all times. The pilot valve 43, therefore, seals the main venting ports 42 from the interior of the venting extension 27 at all times and, when it is in the closed position, seals the main venting ports from the main control chamber 34.

Positioned in the outer end portion of the venting extension 27 is a regulating valve seat adapter 47 having a radial flange 48 rigidly clamped against the internal shoulder of the venting extension 27 by the regulating extension 49 which is threadedly connected to the outer end of the venting extension. A seal is provided between the adapter 47 and the bore portion 39 by an O-ring 51 seated in the circumferential groove 52 of the adapter. Compressed between the pilot valve 43 and the regulating valve seat adapter 47 is a spring 53 having its opposite end portions seated against radial surfaces 54 and 55 of the adapter member and the valve, respectively, to urge the valve toward its seat 38.

The bore portion 39 of the venting extension 27 forms a pilot control chamber 56 between the pilot valve 43 and the regulating valve seat adapter 47. This pilot control chamber 56 is in communication with the main control chamber 34 through the axial passageway 57 and radial passageways 58 formed in the pilot valve 43. Extending axially through the regulating valve seat adapter 47 is a passageway 59 of substantially greater diameter than the passageway 57 in the pilot valve 43. The outer end edge of the passageway 59 is shaped to form an annular regulating valve seat 61.

The regulating extension 49 has formed therein a bore 62 of substantially greater diameter than the passageway 59 through the regulating valve seat adapter 47. The outer end of the bore 62 is threaded at 63 and a circumferentially aligned row of pilot venting ports 64 extend angularly outwardly in a generally radial direction from points which are spaced from the end of the bore that is adjacent the regulating valve seat adapter 47. The number and cross-sectional areas of the pilot venting ports 64, as illustrated in Fig. 3, are sufficient

to effect rapid release of the gas from the pilot control chamber 56. It will be noted that the pilot control chamber 56 has a substantially smaller volume than the main control chamber 34, and that the passageway 59 in the regulating valve seat adapter 47 is correspondingly smaller than the passageway 36 in the pilot valve seat adapter 24. Pressure relief vents 65 are angularly arranged to extend between the pilot venting ports 64 and points in the bore 62 of the regulating extension 49 axially outwardly of the pilot venting ports.

A regulating valve 66 is positioned in the bore 62 for axial movement between its seated and fully opened positions. This valve 66 is of solid construction and has a conical inner end portion 67 for engagement with the valve seat 61. The cylindrical portion 68 of the valve 66 slidably engages the bore 62 at the inner ends of the pilot venting ports 64 to close these ports when the valve is in its seated position. The axial length of the portion 68 is such, however, that the inner ends of the pressure relief vents 65 are open to the interior of the bore 62 at all times.

Positioned in the bore 62 of the regulating extension 49, axially outwardly of the regulating valve 66, is a spring 69 of a predetermined strength, as will be later described. The inner end portion of this spring is seated against the radial surface 71 of the regulating valve 66 and the outer end portion of the spring is seated against the radial surface 72 of a spring guide member 73 which is loosely fitted into the bore 62. This spring guide member is held in the bore 62 and its position is adjusted axially of the bore to vary the compression in the spring 69 by an externally threaded adjusting nut 74 which engages the threads 63 in the regulating extension 49. The axially outer surface of the regulating nut 74 is notched at 75 to receive a screw driver, or similar tool, which may be used to turn the nut and thereby adjust the compression in the spring 69. The outer end of the bore 62 of the regulating extension 49 is closed by cap 76 to exclude dust or other foreign matter.

The operation of the cartridge when compressed air, or other gas, is employed, will be described as follows:

The cartridge, in an uncharged condition but connected to a suitable source of supply of the compressed air, or other gas, by the feed line 7, is placed in a previously prepared drill hole formed in the working face of the material to be broken down, such as coal in a mine. At this time the charge release chamber 5 of the cartridge body 4 is sealed from the discharge ports 18 by the engagement of the main valve 19 with its seat 15 and by the O-ring 22. The charge release chamber 5, however, is in communication with the main control chamber 34 through the aperture 35 in the main valve 19. The main control chamber 34 in the discharge section 16 is similarly sealed from the main venting ports 42 by the engagement of the pilot valve 43 with its seat 38 and by the O-ring 45. Communication between the main control chamber 34 and the pilot control chamber 56, however, is provided by the passageways 36, 57 and 58. The pilot control chamber 56 is sealed from the pilot venting ports 64 by the engagement of the regulating valve 66 with its seat 61. Each of the valves 19, 43 and 66 is initially moved to its seated position by the springs 31, 53 and 69, respectively.

The compressed air delivered to the charge release chamber 5 will rapidly build up the pressure therein to the desired work performing value. During this charging of the chamber 5, compressed air is permitted to flow into the main control chamber 34 through the aperture 35 in the valve 19 and from the main control chamber 34 into the pilot control chamber 56 through the passageways 36, 57 and 58. The pressures in the charge release chamber 5, main control chamber 34 and pilot control chamber 56, therefore, will be substantially equal during charging.

At this time, the main valve 19 and the pilot valve 43 will be maintained in their seated or closed positions by

the springs 31 and 53, respectively, and by the differential forces acting upon the opposite ends of the valves. In other words, the effective surface area of the valve 19 exposed to the fluid pressure in the main control chamber 34 is greater than the effective surface area of the valve exposed to the fluid pressure in the charge release chamber 5 while the effective surface area of the pilot valve 43 exposed to the fluid pressure in the pilot control chamber 56 is greater than the effective surface area exposed to the fluid pressure in the main control chamber 34 so that the total forces acting upon the valves are unbalanced in a direction to maintain the valves in their closed positions. The effective surface areas on opposite ends of the valve 19 may be considered as being equal to the cross-sectional area of the main control chamber 34 and the cross-sectional area of the valve seat 15, each minus the cross-sectional area of the aperture 35. The effective surface areas on the opposite ends of the pilot valve 43 may be considered as being equal to the cross-sectional area of the pilot control chamber 56 and the cross-sectional area of the pilot valve seat 38, each minus the cross-sectional area of the passageway 57. Since the valves 19 and 43 are maintained in their closed or seated positions by the differential forces acting on their opposed faces, the springs 31 and 53 are of a type which will exert only a relatively light force upon their respective valves.

The gas pressure in the pilot control chamber 56 will act upon the regulating valve 66 through the passageway 59 over an effective surface area which is equal to the cross-sectional area of the regulating valve seat 61. The force applied to the regulating valve by the pressure of the gas in the pilot control chamber 56, therefore, will be equal to the pressure of the gas times the cross-sectional area of the valve seat 61. This force is opposed by the force applied to the regulating valve 66 by the spring 69. The force applied by the spring 69 is predetermined by selection of a spring of a given strength but may be varied by adjusting the position of the nut 75 in the manner previously described. It will be noted that any small amount of gas which leaks past the regulating valve seat 61 may escape past the valve 66 into the interior of the bore 62 of the regulating extension where it is vented through the pressure relief vents 65.

When the charge release, main control and pilot control chambers 5, 34 and 56, respectively, have received a sufficient volume of gas to raise the pressures therein to the desired work performing value, the pressure of the gas in the pilot control chamber 56 will exert a force on the regulating valve 66 which will be greater than the force of the spring 69. It becomes apparent, therefore, that any work performing pressure that is desired may be obtained by the aforementioned adjustment of the force exerted on the regulating valve 66 by the spring 69. As soon as the force exerted on the regulating valve 66 by the gas pressure in the chamber 56 exceeds the force exerted by the spring 69, the valve 66 will move away from its seat 61 a slight distance so that gas from the pilot control chamber 56 will flow into the bore 62 of the regulating extension 49 and will then be applied to the entire cross-sectional area of the valve 66 so that this valve will be quickly moved to its fully opened position.

When the regulating valve 66 is in its fully opened position, the pilot venting ports 64 will be opened and will remain open for so long as the gas pressure acting on the entire cross-sectional area of the regulating valve 66 is greater than the force of the spring 69. Since the entire cross-sectional area of the valve 66 is many times greater than the effective area of the seat 61, the valve will remain open until the gas pressure acting against the opened valve is reduced to a small fraction of its initial opening pressure.

When the pilot venting ports 64 are opened, air will rapidly flow from the pilot control chamber 56 through the passageway 59 to be vented at a much greater rate

than that at which it can be replenished by the flow of air through the passageways 57 and 58 in the pilot valve 43. The pressure in the pilot control chamber 56, therefore, will be quickly reduced so that the pressure of the gas in the main control chamber 34, acting on the pilot valve 43, will move this pilot valve into its open position in which the main venting ports 42 are in direct communication with the passageway 36. The opening of the pilot valve 43 permits gas to flow from the main control chamber 34 through the passageway 36 and venting ports 42 at a much more rapid rate than it can flow into the chamber 34 through the aperture 35 in the main valve 19. It will be noted that the gas flowing through the passageway 36 and venting ports 42 passes the passageways 58 in the pilot valve 43 and will assist in reducing the pressure in the pilot control chamber 56 by the resulting aspirating action.

The gas pressure in the chamber 34, therefore, will be quickly reduced to a value at which the forces acting on the main valve 19 will be unbalanced in a direction to move this valve into its open position. In other words, the pressure of the gas in the release chamber 5 then will be much greater than that of the gas in the main control chamber 34, so that the valve 19 will be opened and the gas charge in the chamber 5 will be released through the charge release ports 18. Upon discharge of the cartridge the flow of gas through the feed line 7 will be cut off in any desired manner at a point in the line which is remote from the cartridge.

The successive operations of the valves 66, 43 and 19 occurs in an extremely short length of time and results in a very rapid discharge of the compressed gas charge from the chambers 5, 34 and 56. After operation of the cartridge in this manner, the main valve 19, pilot valve 43, and regulating valve 66 will be rapidly returned to their seated positions by the springs 31, 53 and 69, respectively, to recondition the cartridge for a subsequent operation.

It is to be understood that the form of this invention herewith shown and described is to be taken as a preferred example of the same and that various changes in the shape, size, and arrangement of parts may be resorted to without departing from the spirit of the invention or the scope of the subjoined claims.

Having thus described the invention, I claim:

1. In combination, a cartridge having a chamber from which a material breaking charge of compressed gas is to be released, lateral ports at one end portion of the chamber for the release of the gas charge, and a plurality of control chambers arranged successively longitudinally of the cartridge, each of said control chambers having a normally closed valve operatively associated therewith, each of said valves being movable between its open and closed positions by the application of unbalanced opposed forces thereto, resilient mechanical means for applying a predetermined constant force to urge the valve associated with the chamber most remote from said release chamber into its closed position in opposition to the force applied to the valve by the gas pressure in its associated chamber, and means for applying gas pressures to said last mentioned valve substantially equal to the gas pressures in the release chamber during charging of the cartridge to move the valve into its open position when the force exerted on the valve by the gas pressure exceeds the predetermined constant force, the opening of said last mentioned valve effecting a sudden lowering of the pressure of the gas in its associated chamber relative to the pressure of the gas in the preceding chamber to successively open the preceding valves by a sudden lowering of the gas pressure in their next succeeding chambers relative to the pressure of the gas in their next preceding chambers, opening of the valve associated with said release chamber effecting release of the compressed gas charge through the lateral ports.

2. In combination, a cartridge having a chamber from which a material breaking charge of compressed gas is to be released, lateral gas charge release ports, and a control chamber arranged successively longitudinally of said cartridge, a first valve for controlling release of the gas charge from said gas release chamber through the release ports and being exposed to the pressure of the gas in said control and release chambers with a greater effective surface area exposed to said control chamber than to said release chamber, means for equalizing the gas pressures in the release and control chambers during charging of the cartridge, resilient mechanical means urging said valve into its closed position, and venting means for automatically releasing the gas from said control chamber to cause the gas in the release chamber to open the valve when the pressure in said chambers reaches a predetermined value, said venting means comprising a second valve exposed to the pressure of the gas in said control chamber and movable by said pressure into a position for releasing the gas from the control chamber at a faster rate than the gas pressures in said release and control chambers can be equalized by said equalizing means, and a third valve in communication with said release chamber and movable into a position for effecting actuation of said second valve by an increase in the pressure of the gas in the release chamber to a predetermined value.

3. In combination, a cartridge body having arranged successively longitudinally thereof in the order named a chamber in which a material breaking charge of compressed gas is to be developed and from which the charge is to be released, lateral gas charge release ports, a control chamber receiving compressed gas from the release chamber during development of such charge, venting ports, and a pilot control chamber, a first valve positioned in the cartridge body between the release chamber and the control chamber for sealing the release ports, means for equalizing the gas pressures in said release and control chambers during charging of the cartridge, a second valve positioned in the cartridge body between the control chamber and the pilot control chamber for sealing the gas venting ports, and a third valve positioned in the cartridge body in communication with said control chamber and subjected to gas pressures equal to the pressures of the gas in the control chamber during charging of the cartridge, said third valve being opened in response to an increase in the control chamber pressure to a predetermined value to cause the forces applied to said second valve by the gas pressures in said control and pilot control chambers to be unbalanced in a direction to move the second valve and open the gas venting ports, the opening of said venting ports reducing the gas pressure in the control chamber, at a faster rate than the gas pressures in said control and release chambers can be equalized by said equalizing means, to cause the pressure in the release chamber to move the first valve into a position to unseal the release ports.

4. In combination, a cartridge having a chamber from which a material breaking charge of compressed gas is to be released, lateral gas charge release ports, a main control chamber, main venting ports, a pilot control chamber, and pilot venting ports arranged successively longitudinally of said cartridge, a main valve for controlling the release of gas from said charge release chamber through said release ports, a spring urging said main valve into its closed position, a pilot valve for controlling the release of gas from said main control chamber through said main venting ports, a spring urging said pilot valve into its closed position, said main and pilot valves being movably positioned between the release and main control chambers and the main control and pilot control chambers, respectively, and exposed to the gas pressures in their adjacent chambers with the main valve having a greater effective surface area exposed to the main control chamber and the pilot valve having a greater effective

surface area exposed to the pilot control chamber, means for equalizing the pressures in said release, main control and pilot control chambers during charging of the cartridge, and venting means operatively associated with said pilot control chamber and responsive to changes in the gas pressure therein to automatically release gas from the chamber, at a faster rate than the gas pressures in said main control and pilot control chambers can be equalized by said equalizing means, when the pressure increases to a predetermined value.

5. In combination, a cartridge having a chamber from which a material breaking charge of compressed gas is to be released, lateral gas charge release ports, a main control chamber, main venting ports, a pilot control chamber, and pilot venting ports arranged successively longitudinally of said cartridge, a main valve for controlling the release of gas from said charge release chamber to said release ports, a spring urging said main valve into its closed position, a pilot valve for controlling the release of gas from said main control chamber through said main venting ports, a spring urging said pilot valve into its closed position, said main and pilot valves being movably positioned between the release and main control chambers and the main control and pilot control chambers, respectively, and exposed to the gas pressures in their adjacent chambers with the main valve having a greater effective surface area exposed to the main control chamber and the pilot valve having a greater effective surface area exposed to the pilot control chamber, said main and pilot valves each having restricted passageways therethrough for equalizing the pressures in said release, main control and pilot control chambers during charging of the cartridge, a regulating valve for controlling the release of gas from said pilot control chamber through said pilot venting ports, and a spring urging said regulating valve into its closed position, said regulating valve having a surface area exposed to the pressure of the gas in said pilot control chamber to move the valve into its open position and to reduce the pressure in said pilot control chamber at a faster rate than the pressures in said main control and pilot control chambers can be equalized through the restricted passageway in said pilot valve, when the force applied to the valve by the pressure of the gas in said pilot control chamber exceeds the force applied by said last mentioned spring.

6. In combination, a cartridge having a chamber from which a material breaking charge of compressed gas is to be released, lateral gas charge release ports, a main control chamber, main venting ports, a pilot control chamber, and pilot venting ports arranged successively longitudinally of said cartridge, a main valve for controlling the release of gas from said charge release chamber through said release ports, a spring urging said main valve into its closed position, a pilot valve for controlling the release of gas from said main control chamber through said main venting ports, a spring urging said pilot valve into its closed position, said main and pilot valves being movably positioned between the release and main control chambers and the main control and pilot control chambers, respectively, and exposed to the gas pressures in their adjacent chambers with the main valve having a greater effective surface area exposed to the main control chamber and the pilot valve having a greater effective surface area exposed to the pilot control chamber, said main and pilot valves each having restricted passageways therethrough for equalizing the pressures in said release, main control and pilot control chambers during charging of the cartridge, a regulating valve for controlling the release of gas from said pilot control chamber through said pilot venting ports, a spring urging said regulating valve into its closed position, and a seat for said last mentioned spring axially movable to vary the force of the spring acting on the regulating valve, said regulating valve having a limited effective surface area exposed to the pressure of the gas in said pilot control chamber to move the

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valve gradually toward its open position when the force applied to the valve by the pressure of the gas in the pilot control chamber exceeds the force applied by the last mentioned spring, the effective surface area of the regulating valve exposed to the pressure of the gas in the pilot control chamber being greatly increased by the aforesaid gradual movement to effect rapid movement of the regulating valve into its fully open position.

7. A material breaking cartridge, comprising a cartridge body having a main chamber for releasably confining a work performing charge of compressed gas, a main control chamber, and a pilot control chamber; each of said chambers having a series of radial compressed gas release ports, means for introducing gas into each of said chambers to build up the gas pressures in the chambers at a substantially uniform rate to the desired work performing value, a differential force actuated valve for automatically releasing the compressed gas from the pilot control chamber through the release ports for said chamber, at a faster rate than the rate at which gas is introduced to the pilot control chamber through said introducing means, when its pressure reaches the desired work performing value, a differential force actuated valve for auto-

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5 matically releasing the compressed gas from the main control chamber through the release ports for said chamber, at a faster rate than the rate at which gas is introduced to the main control chamber through said introducing means, in response to the release of the compressed gas from the pilot control chamber, and a differential force actuated valve for automatically releasing the charge of compressed gas from the main chamber through the release ports for said chamber into work performing relation to the material to be broken in response to the release of the compressed gas from the main control chamber.

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