July 29, 1924. 1,503,420

E. HUTTON

BLASTING GUN

Filed June 2, 1923

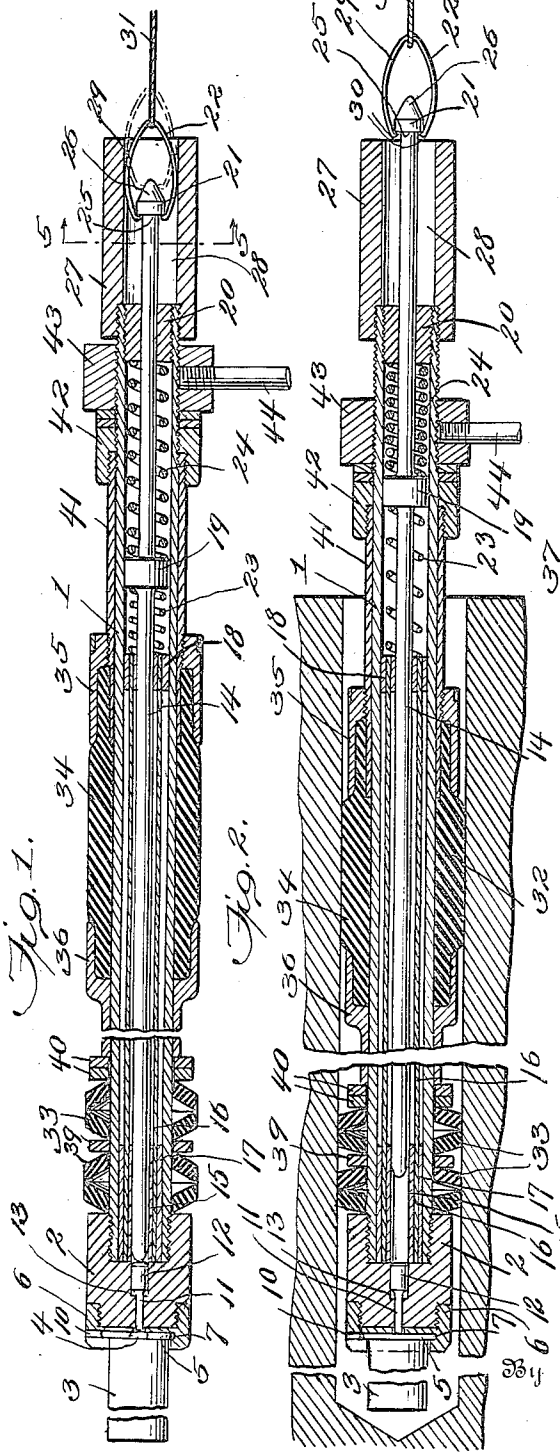


Fig. 1.

Fig. 2.

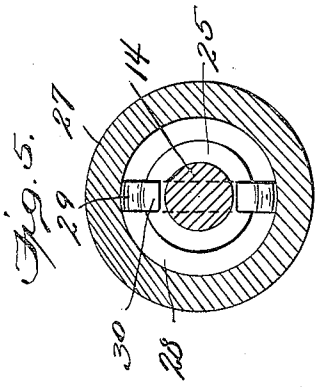


Fig. 5.

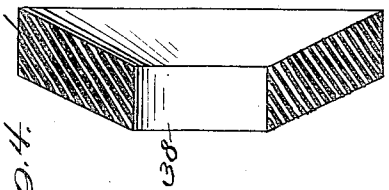


Fig. 4.

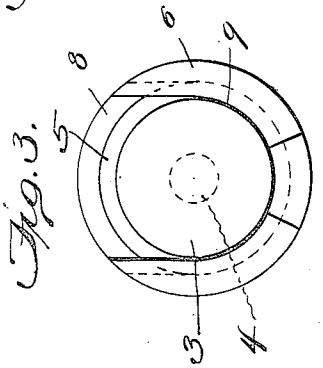


Fig. 3.

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UNITED STATES PATENT OFFICE.

ERNEST HUTTON, OF FAIRMONT, WEST VIRGINIA.

BLASTING GUN.

Application filed June 2, 1923. Serial No. 643,078.

To all whom it may concern:

Be it known that I, ERNEST HUTTON, a citizen of the United States, residing at Fairmont, in the county of Marion and State of West Virginia, have invented certain new and useful Improvements in Blasting Guns, of which the following is a specification.

The present invention relates to improvements in blasting devices and more particularly to those of the class adapted for use in blasting coal in mines, in order to break it down from the coal vein and thus enable it to be loaded on cars, or otherwise removed. A blasting gun of this general character is described in my prior Patent No. 1,241,386, granted September 25, 1917, and the primary object of the present invention is to provide improvements thereon, whereby the blasting charges may be in the form of cartridges which may be fired by percussion primers, from which it results that the operations of applying the blasting charges and firing them can be performed with greater speed, facility and safety, and the packing means which tamps the space between the gun and the bore of the hole in which it is inserted, is so contracted that it is capable of operating efficiently to prevent escape of the gases resulting from the explosion and to hold the gun in place against the force of the explosion, and, moreover, is capable of effectually withstanding the destructive influences of the gases of the explosion, although the packing means may be easily and inexpensively replaced when such is necessary.

To these and other ends, the invention consists in certain improvements and combinations and arrangements of parts, all as will be hereinafter more fully described, the features of novelty being pointed out particularly in the claims at the end of the specification.

In the accompanying drawings:

Figure 1 represents a central longitudinal section through a blasting gun constructed in accordance with the preferred embodiment of the invention;

Figure 2 is a view similar to Figure 1, but showing the blasting gun inserted in the bore in which the explosive is to be fired, the parts being shown in the positions which they occupy immediately prior to the firing of the explosive;

Figure 3 is an enlarged view of the end of the gun which receives the explosive charge;

Figure 4 is an enlarged sectional view taken axially through one of the packing members; and

Figure 5 represents, on an enlarged scale, a section on the line 5—5 of Figure 1.

Similar parts are designated by the same reference characters in the several views.

A blasting gun constructed in accordance with the present invention is suitable for various uses where it is desired to fire an explosive charge for blasting or similar purposes, although it is particularly suitable for use in the blasting of coal. The preferred embodiment of the invention is shown in the accompanying drawing and will be hereinafter described in detail, but it is to be understood that the invention is not restricted to the precise construction shown as equivalent constructions are contemplated and these will be included within the scope of the claims.

In the present instance, the gun comprises a barrel 1 which is preferably cylindrical in cross section and has a head 2 threaded or otherwise firmly secured on its forward end. This head 2 is suitably constructed to receive and hold the explosive charge, and in order to enable the explosive charge to be applied easily and quickly, and with safety to the attendant, the explosive charge is preferably contained in a cartridge 3 of appropriate capacity, the cartridge containing a primer 4 in its base, similar to the primer in rifle cartridges and adapted to be exploded by a firing pin to cause ignition of the blasting charge contained in the cartridge. The base of the cartridge is also preferably provided with a rim or flange 5. The head 2 which, in the present instance, is adapted to receive an explosive charge in cartridge form, as just described, is provided for this purpose with a cap 6 which may be threaded or otherwise secured thereon, this cap having an undercut recess 7 to receive the rim or flange 5 of the cartridge, and a slot 8 which leads from one side of the cap into a central opening 9 therein, the opening 9 being of a size to receive the body of the cartridge and thereby center and position it relatively to the head 2. The walls of the laterally extending slot 8 are also undercut, as at 10, in continuation of the undercut recess 7, the construction described enabling a cartridge to be applied to the head of the

gun by sliding the base of the cartridge laterally through the slot 8 until its body is seated and centered in the opening 9. An exploded cartridge can be easily and quickly removed by withdrawing its base from the cap 6 by an outward movement of the base of the cartridge through the lateral slot 8.

The head 2 contains a firing pin 11 which is preferably positioned centrally of the head and in axial alinement with the primer 4 of a cartridge, when the latter is applied to the cap. To prevent dropping of the firing pin from the gun during handling of the latter, the firing pin is preferably formed with an enlarged body 12 to operate in a recess 13 formed within the head. The firing pin is actuated, according to the present invention, by a rod 14 which is preferably mounted concentrically with the axis of the barrel 1 and is reciprocable longitudinally therein. As shown, the forward end of the rod 14 is supported and held in alinement with the firing pin 11 by a sleeve 15 which is contained within a tube 16, the latter being fixed within the barrel 1 and held centered therein by surrounding sleeves 17 and 18. The intermediate portion of the rod 14 preferably has a collar or shoulder 19 thereon which fits slidingly within the barrel, and the rear end of the rod extends slidingly through a plug 20 threaded or otherwise fixed in the rear end of the barrel and is provided with a head 21 to receive a retracting and releasing device 22. The forward end of the rod 14 is normally held out of contact with the firing pin 11 by a compression spring 23 which is interposed between the collar 19 and the rear end of the interior tube 16, and the rod 14 is actuated or propelled forward to impart a blow to the firing pin by a compression spring 24 which is interposed between the rear side of the collar 19 and the plug 20 in the rear end of the barrel.

The present invention provides simple and safe means for retracting the rod 14 against the compression of its actuating spring 24 and for tripping the rod to cause it to be impelled forward by the spring 24 and to strike the firing pin 11, in consequence of which the firing pin explodes the primer 4 in the cartridge and the blasting charge in the latter is thereby exploded. As shown in the present instance, the head 24 on the rear end of the rod 14 provides a substantially perpendicular shoulder 25 and a tapered portion 26 which leads to the periphery of the head. A guard 27, which is preferably cylindrical in cross section is threaded or otherwise secured to the rear end of the barrel, this guard having an interior bore 28 which is larger in diameter than the head 21, the guide terminating short of the rear limit of movement of the head 21.

The retracting and tripping device for the rod 14 comprises preferably a yoke 29, the forward ends 30 of which are bent inwardly to engage the perpendicular shoulder 25 on the head 21, the yoke being attached to a cord 31 of suitable length and which is adapted to be pulled by the attendant to effect retraction and tripping of the rod 14. In operation, the yoke 29 is inserted into the rear end of the bore 28 in the guard 27 and is pushed forward therein, in consequence of which the inturned ends 30 on the yoke will encounter and ride on the tapered portion 26 of the head 21, thereby spreading apart the inturned ends 30 which may take place owing to the fact that the yoke 29 is composed of resilient material and when the yoke has been pushed forward sufficient to bring the inturned ends 30 thereof beyond the shoulder 25 on the head, these inturned ends of the yoke snap inwardly and assume positions in front of the shoulder 25. To fire the gun, it is only necessary to pull the cord 31, the yoke 29 in consequence drawing the rod 14 rearwardly until the head 21 projects beyond the rear end of the guard 27, whereupon the guard will no longer retain the yoke 29 in engagement with the head 21, so that the yoke will become disengaged laterally from the head and the spring 24 will then act to shoot the rod 14 forward, causing it to strike the firing pin 11, which latter, in turn, fires the primer and in consequence the blasting charge in the cartridge.

The present invention provides improved packing means for tamping the space between the gun and the bore of the hole in which it is inserted. In the present instance, Figure 2 shows the blasting device in the bore of the hole which is drilled or otherwise formed in the coal to be blasted, the hole, according to the usual practice, being cylindrical, or substantially so. The packing means shown in the present instance comprises a main packing 32 and an auxiliary packing 33. The main packing is preferably in the form of a sleeve of rubber 34 of suitable length, which surrounds the barrel of the gun and has its ends fitted within abutments 35 and 36, these abutments being preferably undercut, as shown, to fit over and thus retain the ends of the packing member. The construction is such that when the packing member 34 is in its normal condition it will enter the bore of the hole in which the charge is to be exploded and when the abutments 35 and 36 are shifted relatively in a direction toward one another, longitudinal compression will be exerted on the packing member 34 which will cause the latter to expand and thereby increase its transverse diameter, substantially as is shown in Figure 2, this packing member being thus forced outwardly against the wall of the bore or hole and thereby filling and tamping the space between the wall of the

bore and the gun. The auxiliary packing means is preferably provided between the main packing member 34 and the head 2 which carries the blasting charge, so that this auxiliary packing means will be interposed between the exploded charge and the main packing member and will thus protect the main packing member from the high temperature and high pressure and other destructive influences of the exploded charge. Preferably and as shown, the auxiliary packing means comprises a suitable number of pairs of disks 37 composed of rubber or similar resilient material. Each disk is formed preferably with a circular periphery and with a central hole 38 to fit over the barrel of the gun, and each disk has substantially the form of a truncated cone, as shown in Figure 4; that is, one face of the disk has a conical concavity, while the other face of the disk has a conical convexity. The disks are assembled on the barrel of the gun, so that the concave sides of the disks forming each pair are presented toward one another. Preferably and as shown, these disks constituting the auxiliary packing means are assembled on the barrel between the head 2 and the abutment 36 for the main packing member, metal washers 39 and 40 being interposed between the pairs of disks and between the rearmost disk and the abutment 36 respectively. By shaping the disks as described and assembling them in the manner set forth, the peripheral edges of the disks of each pair will be in contact, but the bodies of the disks will be separated by a cavity; and when the disks are compressed or subjected to a force acting thereon axially of the gun, the disks will be spread from the shape shown in Figure 1 into substantially the shape shown in Figure 2, the force acting axially on the disks causing them to flatten, and in so doing to expand and increase their diameter, the disks being thereby forced outwardly into engagement with the wall of the bore, thereby closing the space between it and the gun. Different means may be provided for axially compressing the main packing means 32 and the auxiliary packing means 33. Preferably and as shown in the present instance, means is provided for simultaneously expanding both packing means, the abutments 35 and 36 being, for this purpose, both movable longitudinally on the barrel 1 of the gun. The abutment 35 is threaded on or otherwise secured to a sleeve 41 which is slidable longitudinally on the barrel, this sleeve having a head 42 fixed thereon which is arranged to be engaged by a nut 43, the latter being threaded on the outside of the barrel 1 and provided with a pin or handle 44 by means of which it may be rotated. By this construction, when the nut 43 is rotated to carry it into its rear position, substantially as is shown in Figure 1, the abutments 35 and 36 will be relatively spread apart and the main auxiliary packing means will be free of axial compression or substantially so. The main and auxiliary packing means at this time will be of contracted diameter, so that the gun may be easily and quickly inserted into the hole in which the blasting charge is to be fired. After the gun has been inserted into the hole, the nut 43 is rotated to shift it toward the forward end of the gun or into substantially the position shown in Figure 2, in consequence of which the sleeve 41 will be pushed forwardly relatively to the barrel 1, causing the abutment 35 to approach the abutment 36, whereby the main packing member 34 is compressed axially and expanded transversely. As the abutment 36 is slidable on the tube 1 of the gun, it will be forced forwardly on the gun barrel in response to the axial compression exerted on the main packing member 34, and in consequence the auxiliary packing means 33 will be subjected to axial compression, whereby the dished or cupped disks will be expanded outwardly into engagement with the wall of the hole. The construction and mode of expanding the main and auxiliary packing means are such that outward force exerted on the gun by the explosion of the blasting charge will cause such packing means to further expand and more tightly engage the wall of the hole, thus maintaining a gas tight fit which will prevent blowing of the gases of the explosion past the gun, and, moreover, the packing means will prevent dislodgement of the gun from the hole, the increased expansion of the packing means under the force of the explosion being due to the fact that the axial thrust imposed upon the head 2 of the gun will produce increased axial compression of the packing means, and hence increased lateral expansion of the packing means.

A blasting gun constructed in accordance with the present invention is particularly suitable for the blasting of coal from a vein in the mine, it being advantageous to explode the blasting charges in holes located at relatively close intervals, in consequence of which the coal can be knocked down from the vein by comparatively small explosive charges. The convenient form in which the blasting charge may be handled and applied to the gun and the provision of means for firing the charges by percussion enables the charge to be applied quickly and with facility, and fired easily and with certainty, and with safety to the attendant. The effectiveness of the blasting charges is greatly increased by the improved packing means which practically prevents the loss of any of the force of the exploded charge by leakage past the gun; and the security with

which the packing means retains the gun in place also enables the blasting operations to be performed without danger to the attendants.

I claim as my invention:—

1. A blasting gun comprising a barrel having a head at one end provided with a seat to receive and hold a blasting cartridge having a percussion primer, a firing pin in the head to detonate the primer, and a reciprocatory member guided to operate longitudinally within said barrel and having means for projecting it against the firing pin.

2. A blasting gun comprising a barrel having a socket at one end to receive a blasting cartridge provided with a percussion primer, a firing pin arranged to strike the primer of the cartridge, and a reciprocatory rod having means for yieldingly holding it out of contact with the firing pin, and means for projecting it against the firing pin.

3. A blasting gun comprising a barrel having at its forward end an undercut socket slotted at one side to receive the flanged base of a blasting cartridge whereby the latter will project from and beyond the forward end of said barrel, a firing pin arranged to strike a percussion primer in a cartridge in said socket, and a reciprocatory member having means for impelling it against the firing pin.

4. A blasting gun comprising a barrel provided at its forward end with a socket to receive a blasting cartridge having a percussion primer, a firing pin to strike the primer in a cartridge in said socket, and a reciprocatory member having means for normally holding it out of engagement with the firing pin and also having means for impelling it against the firing pin.

5. A blasting gun comprising a barrel having means at its forward end for supporting a blasting cartridge and a percussion primer therefor, a firing pin arranged to strike the primer, a rod reciprocable longitudinally in the barrel and having its forward end arranged to coact with the firing pin, a spring acting in one direction on said rod to hold it out of engagement with the firing pin and a second spring acting in the opposite direction on said rod when the latter is retracted to impel said rod against the firing pin.

6. A blasting gun comprising a barrel having means to support a blasting cartridge and a percussion primer therefor, a firing pin to strike the primer, a rod reciprocable longitudinally in the barrel and adapted to coact with the firing pin, said rod having a collar fixed thereon, a spring acting on one side of said collar to normally hold said rod out of engagement with the firing pin, and a second spring acting on the opposite side of said collar for impelling the rod against the firing pin.

7. A blasting gun having means for supporting a blasting cartridge and a percussion primer therefor, a reciprocatory rod for firing said primer, said rod having a head thereon and a flexible yoke adapted to snap over and engage said head to retract said rod and to disengage from said rod while the latter is being retracted thereby.

8. A blasting gun having means for supporting a blasting cartridge and a percussion primer therefor, a reciprocatory rod for firing said primer, said rod having a head thereon, a sleeve in and beyond which said head is movable, and a flexible yoke adapted to snap over and engage said head when the yoke is inserted into said sleeve but disengageable from said head when the latter is retracted beyond said sleeve.

9. A blasting gun having means for supporting a blasting cartridge and a percussion primer therefor, a reciprocatory rod for firing said primer, said rod having a head thereon provided with a shoulder at one end thereof and an inclined portion at its opposite end, a sleeve within and beyond which said head operates, and a yoke having portions adapted to spring over said head and engage the shoulder thereof while said head is within said sleeve, the yoke being disengageable from said head when the latter has been retracted beyond the end of the sleeve.

10. A blasting gun adapted to receive a blasting charge at its forward end, main packing means at an intermediate point in the length of the gun and expansible laterally to tamp the hole in which the gun is inserted, auxiliary packing means located on the gun at a point between said main packing means and its forward end, and means for compressing the auxiliary packing means axially to expand it laterally to tamp the hole.

11. A blasting gun adapted to receive a blasting charge at its forward end, main and auxiliary packing means located at different points in the length of the gun, and means common to both packing means for concurrently compressing them axially and thereby expanding them laterally.

12. A blasting gun comprising a barrel having means at its forward end for supporting a blasting charge, and packing means for tamping the gun in a hole, said means comprising a pair of disks loosely fitted on the barrel, said disks being concave at their contacting sides and convex at their outer sides, and means for compressing said disks axially to cause them to expand radially.

In testimony whereof I have hereunto set my hand.

ERNEST HUTTON.