

E. HUTTON.
BLASTING DEVICE.
APPLICATION FILED NOV. 24, 1916.

1,241,386.

Patented Sept. 25, 1917.
2 SHEETS—SHEET 1.

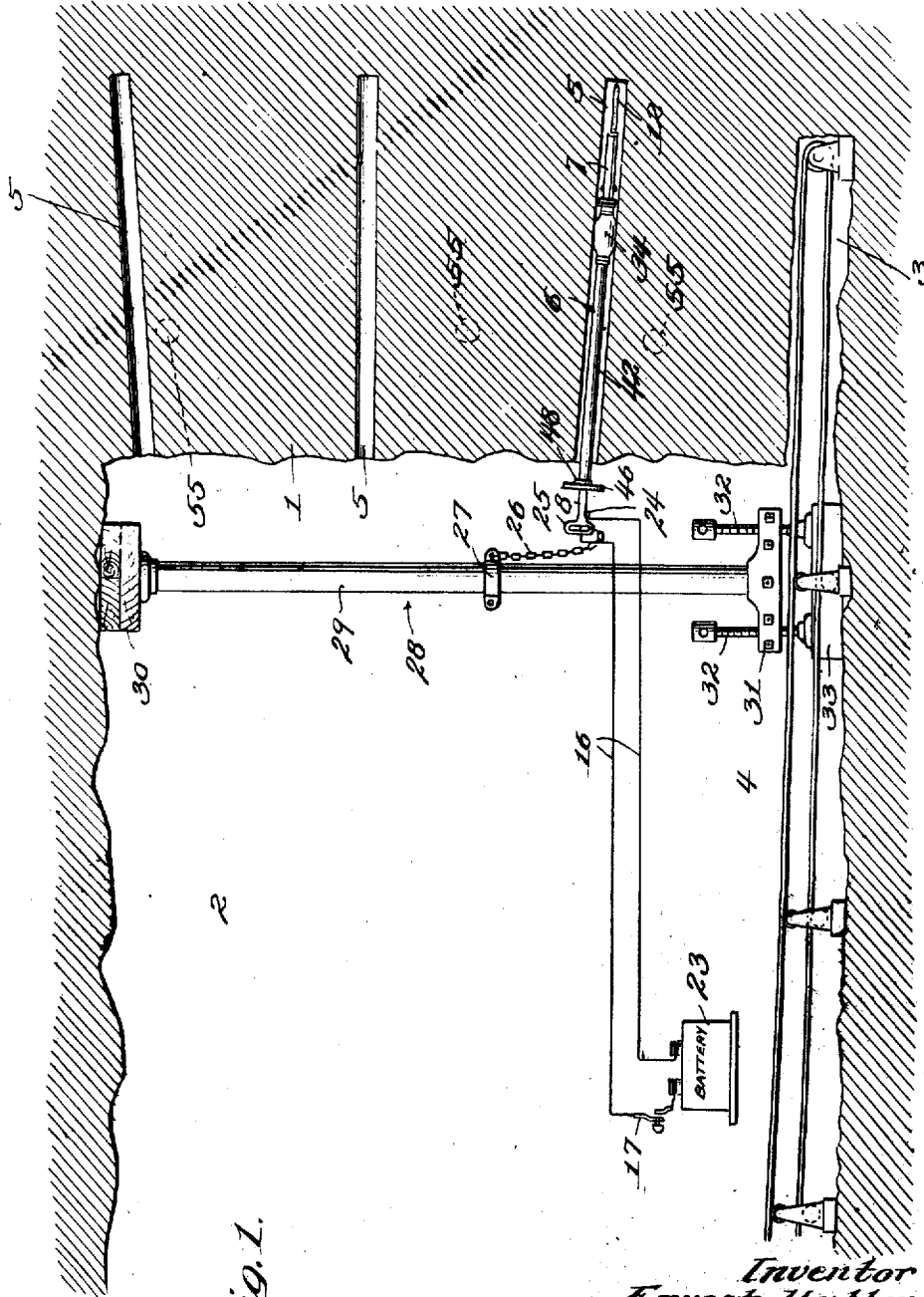


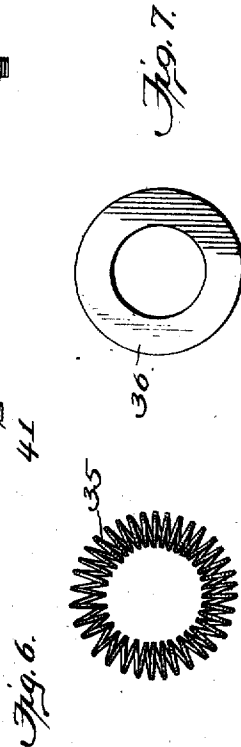
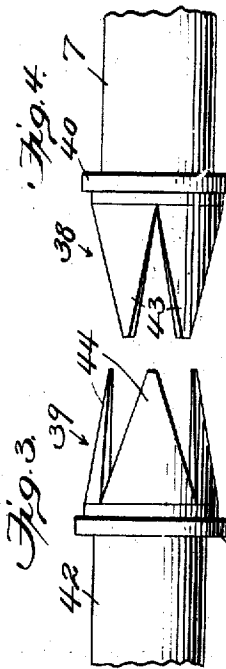
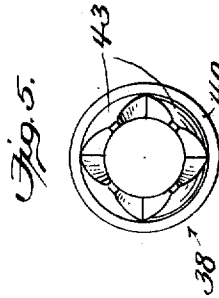
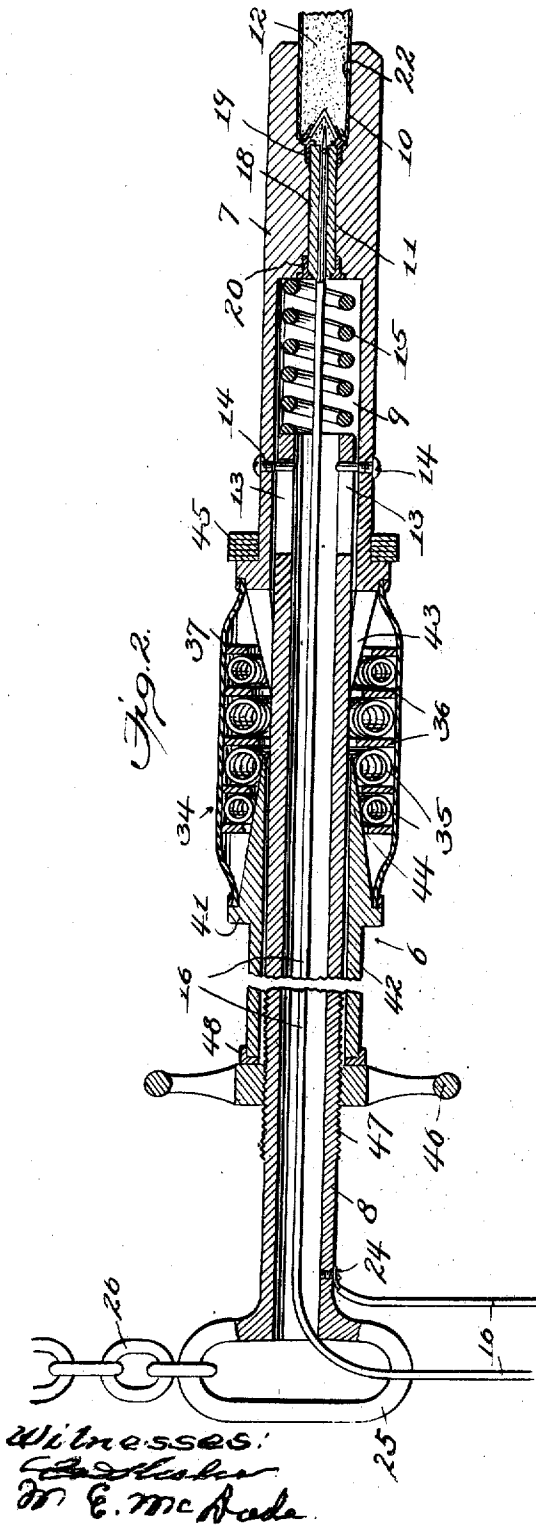
Fig. 1.

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Patented Sept. 25, 1917.
2 SHEETS—SHEET 2.



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UNITED STATES PATENT OFFICE.

ERNEST HUTTON, OF WAYLAND, KENTUCKY.

BLASTING DEVICE.

1,241,386.

Specification of Letters Patent.

Patented Sept. 25, 1917.

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To all whom it may concern:

Be it known that I, ERNEST HUTTON, a citizen of the United States, residing at Wayland, in the county of Floyd and State of Kentucky, have invented new and useful Improvements in Blasting Devices, of which the following is a specification.

The present invention has reference to blasting devices, and it proposes, briefly, an improved implement which is designed primarily for use in coal mining to successively break down the coal in comparatively small quantities directly over and upon a conveyer, whence it is carried away to a point where it can be readily loaded upon the mine cars. In this way, the cost of mining is reduced to a very considerable extent over the methods ordinarily followed, since the expensive and slow pick-work is avoided, while, on the other hand, less powder is required per ton mined and the coal is not pulverized, as is the case when heavy charges are employed, the entire operation being carried out with lessened danger to the miners.

According to the invention, the entire face of the vein is undercut close to the floor of the chamber, to receive the end of the conveyer, and above such opening a passage or a bore is drilled for the explosive charge, the latter being carried by an element in the nature of a gun, which is inserted in the bore, and through which is led the wire or other flexible ignition device. The gun is equipped with a stop or buffer, which is subjected to a preliminary expansion, prior to exploding the charge, for the purpose of choking up the bore and thereby maintaining the implement in place therein; and when the explosion takes place, the stop or buffer is further expanded by the recoil so that it now becomes wedged sufficiently tight in the bore to prevent any blow-out there-through. Consequently, the full action of the explosion takes place in a downward direction, with the result that a quantity of coal is knocked down upon the conveyer. Another bore or passage, which has been drilled at a height of two or three feet above

the first bore, is then successively charged and fired in the same way, the operation being repeated until the top of the vein is reached. At that time, a recess will have been formed in the face of the vein, about three or four feet in depth, and of the same width, the next blastings being made across the face, one above another, directly over the conveyer.

An embodiment of the invention is illustrated in the accompanying drawing, whereof:

Figure 1 is a vertical sectional view taken through the chamber and the face of the vein, and showing the gun inserted in one of the bores or passages formed in the vein, and the various parts or instrumentalities employed in connection with the gun.

Fig. 2 is an enlarged longitudinal section of the said gun.

Figs. 3 and 4 are fragmental side elevations of the two devices for expanding the buffer.

Fig. 5 is an end view of the expander shown in Fig. 4.

Figs. 6 and 7 are side views of the expansion and packing rings disposed within the buffer.

Fig. 8 is a sectional view of a part of the ignition device.

Referring more particularly to said drawing, the face 1 of the vein of coal is undercut entirely across it at a point close to the floor of the chamber 2, to provide a recess or opening 3 for the receiving end of the conveyer 4, and above this recess horizontal passages or bores 5 are drilled, one above another and at intervals of about two or three feet apart, until the top of the face or breast is reached, the bores extending inward to substantially the same extent as the recess 3, i. e., approximately two or three feet. The conveyer is here shown as in the form of a flexible endless belt, driven from any desired source of power.

The gun 6, which embodies the principal features of the invention, as already stated, comprises a slidable cylindrical element 7 that forms the barrel of the gun, and an

elongated tubular body 8 whereon said barrel is telescopically mounted, the rear portion of the latter being provided for that purpose with a longitudinal socket 9 to receive the end of the gun body; see Fig. 2. At its front end, the barrel 7 is provided with a second longitudinal socket 10, which aligns with the rear socket 9, but has a smaller diameter than that socket, the two sockets 9 and 10 being connected by an axial neck or passage 11 of still smaller diameter, and the front socket 10 being utilized to receive the explosive charge 12, which may be, and preferably is, in cartridge form, as shown. The sliding movement of the barrel upon the tubular body 8 is limited by means of a pin-and-slot device, comprising, in this instance, two or more slots 13 formed in said body, and a corresponding number of pins 14 fixed to the barrel and projecting radially inward through said slots. The end of the aforesaid body 8 terminates sufficiently far short of the end wall of the socket 9 to provide space for the reception of an expansible coil spring 15, which tends to normally hold the barrel in its outermost position.

The explosive charge 12 may be ignited in any desired manner, and by means of any suitable flexible spark-conducting device. Preferably, however, there is employed for this purpose an electric circuit 16 closable by a switch 17, (Fig. 1), in which circuit a spark plug 18 is included, said spark plug fitting in the restricted connecting passage 11 and having the opposite ends of its body portion fitted in metal caps or bushings 19 and 20 which hold it in place. The front or outer cap 19, shown in detail in Fig. 8, is formed with a narrow pointed or V-shaped bridge 21 that serves the double function of a terminal or contact, and of a perforator for the shell or wrapper 22 of the cartridge. One of the wires of the circuit 16 is led from the source of current or battery 23, successively through the open-ended gun body 8, the passage 9, and the body of the spark plug, and into the space between the arms of said bridge, while the other circuit wire is grounded at 24 on the outer end portion of the aforesaid body 8, the latter being provided at such point with an open handle 25. The battery 23, which is of such a character as to produce a spark at the gap between the bridge and the terminal of the circuit wire, is located a considerable distance from the face or breast of the coal, and the handle 25 of the gun is connected by a chain 26 with a collar 27, adjustably clamped to a suitable jack 28, which serves to prevent the gun from being thrown upon the floor of the chamber by the force of the explosion. In the present instance, the jack 28 is shown as comprising

a vertical post or pillar 29, which carries the above-mentioned collar 27 and is provided at its upper end with a block 30 to engage the roof of the chamber, and at its lower end with a foot-plate 31, connected by screws 32 with an adjustable base-block 33, that rests upon the floor of said chamber; (see Fig. 1).

Intermediate its ends, the gun is provided with the stop or buffer 34, which as originally stated, is subjected to an initial expansion to hold the gun in place in the bore and is subsequently further expanded by the recoil of the barrel, to wedge the buffer more tightly in the bore, and thus cause the force of the explosion to be exerted solely in a downward direction and to prevent it from blowing out through said bore. This device preferably comprises a series of alternating expansion and packing or spacing rings 35 and 36, inclosed by a canvas or other flexible cover 37 and constructed, respectively, of coiled wire and felt, leather or the like, the spring rings tending to normally maintain it in a contracted condition. The expanding means associated with the device consist of a pair of co-acting members 38 and 39, (Figs. 3, and 4), having annular rims or flanges 40 and 41, to which the ends of the canvas cover 37 are secured, said members being provided upon the confronting inner ends of the barrel 7 and of an outer tubular member or sleeve 42 which fits loosely over the body 8. These members 38 and 39 are formed with fingers 43 and 44, which taper both in width and in thickness from their inner to their outer ends, the fingers of one member being arranged in staggered relation to those of the other member, so as to enable them to enter the spaces between each other. In other words, the arrangement permits an interfitting or interdigital engagement of the two sets of fingers, and this, in turn, enables the said members to move closer together than would otherwise be possible; and when such movement occurs, the rings 35 and 36 are gradually expanded radially, in all directions simultaneously, owing to the wedging action exerted upon them by said members. If desired, a composite or laminated packing ring or washer 45 may be arranged against the rear face of the flange 40.

The initial or preliminary expansion of the buffer is effected by means of a hand wheel 46, which is engaged with the externally-threaded forward portion 47 of the outer tubular body 8, said hand wheel having its hub abutting against a cap or bushing 48 fitted upon the outer end of the tube or sleeve 42. Rotation of said wheel in the proper direction, will thus force the sleeve or tube 42 along the body 8 toward the barrel 7, as will be understood, the expand-

ing member 39 moving with said tube toward its companion member 38, so as to press the rings 35 and 36 outward.

In operation, after the drilling of the various openings 3 and 5 has been completed, and the end of the conveyer has been adjusted to bring it directly below the first or lowermost opening 5, the cartridge 12 containing the explosive charge is fitted in the outer socket 10 of the barrel 7, so that the pointed terminal 21 of the spark plug will puncture the shell or wrapper 22 of the cartridge and project into the charge, as represented in Fig. 2, it being understood that the wiring of the gun has previously been effected. The gun is then inserted into the aforementioned lowermost opening until the end of the cartridge contacts with the end wall of said opening, after which the buffer 34 is given its preliminary expansion, by operating the hand wheel 46 in the manner above described, and the switch 17 then closed to fire the charge. When the explosion takes place, it acts in a downward direction, as above explained, and breaks down the coal in quantities approximating one thousand pounds in actual practice, the recoil of the barrel produced by the explosion action against the buffer member 38 with the result that the buffer is further expanded to an extent sufficient to preclude any blow-out through the bore or opening 5. The coal is then removed by means of the conveyer, and the gun reloaded and inserted in the next higher bore 5, after which the same steps are followed as before. The operations are repeated until the topmost bore has been shot, the subsequent shots being made across the face of the vein. The bores or drill holes 55 for these last shots likewise overlie the conveyer end, but they extend substantially at right-angles to the bores 5, as will be understood. See the dotted-line showing in Fig. 1. If necessary, the conveyer end may be adjusted for the final shots, and it may also be adjusted for the various first-mentioned shots, if advisable, the extension of the undercutting entirely across the face of the vein permitting such adjustment.

I claim as my invention:—

1. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof, and provided with a charge-containing socket; means for exploding the charge; and a buffer mounted on said body and adapted to be expanded by the recoil of said barrel consequent upon explosion, so as to wedge said buffer tightly against the walls of said bore and thus prevent blow-out therethrough.

2. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted

upon the forward end thereof, and provided with a charge-containing socket; means for exploding the charge; a buffer mounted on said body and adapted to be expanded by the recoil of said barrel consequent upon explosion, so as to wedge said buffer tightly against the walls of said bore and thus prevent blow-out therethrough; and means for imparting a preliminary expansion to said buffer, prior to explosion, to maintain the gun in place in said bore.

3. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof, and provided with a charge-containing socket; means for exploding the charge; a buffer mounted on said body and adapted to be expanded by the recoil of said barrel consequent upon explosion, so as to wedge said buffer tightly against the walls of said bore and thus prevent blow-out therethrough; and means, independent of said barrel, for imparting a preliminary expansion to said buffer, prior to explosion, to maintain the gun in place in said bore.

4. A mining gun for insertion in a drill hole or bore, having a charge containing socket, and also having a buffer adapted to be expanded automatically consequent upon explosion of the charge, so as to wedge said buffer tightly against the walls of said bore and thus prevent blow-out therethrough.

5. A mining gun for insertion in a drill hole or bore, having a charge-containing socket, and also having a buffer adapted to be expanded automatically consequent upon explosion of the charge, so as to wedge said buffer tightly against the walls of said bore and thus prevent blow-out therethrough; and means for manually imparting a preliminary expansion to said buffer, prior to explosion, to maintain the gun in place in said bore.

6. A mining gun for insertion in a drill hole or bore, having a charge-containing socket, and also having a buffer; and a pair of members for expanding the buffer, so as to cause it to become tightly wedged in said bore, one of said members being automatically movable toward the other member consequent upon the explosion, to effect such expansion.

7. A mining gun for insertion in a drill hole or bore, having a charge-containing socket, and also having a buffer; a pair of members for expanding the buffer, so as to cause it to become tightly wedged in said bore, one of said members being automatically movable toward the other member consequent upon the explosion, to effect such expansion; and means for moving said other member toward the first-named member prior to the explosion, to effect a prelimi-

nary expansion of the buffer, to maintain the gun in place in said bore.

8. A mining gun for insertion in a drill hole or bore, having a charge-receiving socket, and also having a buffer comprising a plurality of expansible rings and a flexible cover therefor; and a pair of members engageable with said rings to expand the same and thereby cause said buffer to become tightly wedged in said bore, one of said members being automatically movable toward the other member consequent upon the explosion, to effect such expansion.

9. A mining gun for insertion in a drill hole or bore, having a charge-receiving socket, and also having a buffer comprising a plurality of expansible rings and a flexible cover therefor; and a pair of members engageable with said rings to expand the same and thereby cause said buffer to become tightly wedged in said bore.

10. A mining gun for insertion in a drill hole or bore, having a charge-receiving socket, and also having a buffer; and a pair of co-acting reversely-tapered members capable of relative movement toward each other to expand said buffer and thereby cause it to become tightly wedged in said bore.

11. A mining gun for insertion in a drill hole or bore, having a charge-receiving socket, and also having a buffer; and a pair of relatively-movable, co-acting members having reversely-tapered fingers for expanding said buffer, so as to cause it to become tightly wedged in said bore, said fingers arranged to interfit during such movement.

12. A mining gun for insertion in a drill hole or bore, having a charge-receiving socket, and also having a buffer comprising a plurality of expansible rings and a flexible cover therefor; and a pair of reversely-tapered members capable of relative movement toward each other, to engage and expand said rings and thereby cause said buffer to become tightly wedged in said bore.

13. A mining gun for insertion in a drill hole or bore, having a charge-receiving socket, and also having a buffer comprising a plurality of expansible rings and a flexible cover therefor; and a pair of co-acting members movable toward each other, and having reversely-tapered fingers for engaging and expanding said rings, so as to cause said buffer to become tightly wedged in said bore.

14. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof, and provided with a charge-containing socket; a buffer encircling said body and adapted to be expanded, to cause it to become tightly wedged in said bore; and a pair of co-acting members associated with said buffer and located

one on said barrel and the other on said body, the first-named member being moved toward the second-named member to effect such expansion by the recoil of the barrel consequent upon explosion of the charge.

15. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof, and provided with a charge-containing socket; a buffer encircling said body and adapted to be expanded, to cause it to become tightly wedged in said bore; and a pair of co-acting, reversely-arranged, wedge-shaped members located one on said barrel and the other on said body, the first-named member being moved toward the second-named member to effect such expansion, by the recoil of the barrel consequent upon explosion of the charge.

16. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof and provided with a charge-containing socket; a sleeve mounted upon said body in rear of said barrel; a buffer encircling said body between the confronting ends of said barrel and said tube, and adapted to be expanded into wedging engagement with the walls of said bore; and co-acting devices located on said confronting ends and movable toward each other, to effect such expansion.

17. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof, and provided with a charge-containing socket; a buffer encircling said body and adapted to be expanded to cause it to become tightly wedged in said bore; a pair of co-acting devices associated with said buffer and located one on said barrel and the other on said body for relative movement toward each other to effect such expansion, the movement of the first-named member being produced automatically by the recoil of said barrel consequent upon explosion of the charge; and means independent of said barrel for manually effecting the movement of the second-named member, to impart a preliminary extension to said buffer.

18. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof and provided with a charge-containing socket; a sleeve mounted upon said body in rear of said barrel; a buffer encircling said body between the confronting ends of said barrel and said tube, and adapted to be expanded into wedging engagement with the walls of said bore; and co-acting devices located on said confronting ends and movable toward each

other, to effect such expansion, the movement of the barrel-carried device being produced automatically by the recoil of said barrel consequent upon explosion of the charge.

19. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body; a barrel slidably mounted upon the forward end thereof and provided with a charge-containing socket; a sleeve mounted upon said body in rear of said barrel; a buffer encircling said body between the confronting ends of said barrel and said tube, and adapted to be expanded into wedging engagement with the walls of said bore; co-acting devices located on said confronting ends and having relative movement toward each other to effect such expansion, the movement of the barrel-carried device being caused by the recoil of the barrel consequent upon explosion of the charge; and means for moving said sleeve along said body toward said barrel, to produce the movement of the sleeve-carried device.
20. A mining gun for insertion in a drill hole or bore, comprising, in combination, a tubular body having its rear portion formed with an external thread; a barrel slidably mounted upon the forward portion of said body and provided with a charge-receiving socket; a sleeve slidably mounted upon said body in rear of said barrel; a buffer encircling said body between the confronting ends of said barrel and said sleeve and adapted to be expanded into wedging engagement with the walls of said bore; a pair of co-acting devices located on said confronting ends and having relative movement toward each other to effect such expansion, the movement of the barrel-carried device being caused by the recoil of the barrel consequent upon explosion of the charge; and a manually-operable member engaged with the threaded portion of said body and abutting against the rear end of said sleeve to force the latter along said body toward said barrel, thereby to produce the movement of the sleeve-carried device.

21. A mining gun, provided with a barrel having a charge-receiving socket at its outer end; a spark plug fitted in the bore of said barrel in rear of said socket and having a narrow, pointed bridge-piece at its front end, which projects directly into the charge and constitutes an electrical contact or terminal; and means for producing an electric spark at said bridge-piece, to explode the charge.

22. A mining gun, provided with a barrel having a charge-receiving socket at its outer end and a recess or socket of less diameter than the charge socket located directly in rear of the latter and opening through the rear wall thereof; a spark plug fitted in the

rear socket and provided with a forwardly-projecting, V-shaped bridge which extends into the charge socket, so as to penetrate the charge; and means for producing an electric spark at said bridge, to explode the charge.

23. Mining apparatus of the character specified, comprising, in combination, a conveyer having its receiving end adapted for disposition in an opening or recess cut in the bottom of the face of the vein to be mined; a mining gun for insertion in a horizontal drill hole or bore located directly over said conveyer end, said gun having a socket to contain a cartridge of explosive material; means on said gun for maintaining it in place in the bore and for preventing blow-out therethrough, and means for exploding said cartridge, so as to cause the force of the explosion to break down the material being mined directly upon the said conveyer end, to be removed by said conveyer.

24. Mining apparatus of the character specified, comprising, in combination, a receiving element for disposition in an opening or recess cut in the bottom of the face of the vein to be mined; a mining gun for insertion in a horizontal drill hole or bore located directly over said receiving element, said gun having a socket to contain a cartridge of explosive material; means for exploding said cartridge, so as to cause the force of the explosion to break down the material being mined directly upon said receiving element; and means on said gun for choking up said bore, to prevent blow-out therethrough during the explosion.

25. Mining apparatus of the character specified, comprising, in combination, a receiving element for disposition in an opening or recess cut in the bottom of the face of the vein to be mined; a mining gun for insertion in a horizontal drill hole or bore located directly over said receiving element, said gun having a sliding barrel provided with a socket to contain a cartridge of explosive material; means for exploding said cartridge, so as to cause the force of the explosion to break down the material being mined directly upon said receiving element; and means on said gun expanded automatically by the recoil of said barrel consequent upon explosion for choking up said bore, to prevent blow-out therethrough during the explosion.

26. Mining apparatus of the character specified, comprising, in combination, a receiving element for disposition in an opening or recess cut in the bottom of the face of the vein to be mined; a mining gun for insertion in a horizontal drill hole or bore located directly over said receiving element, said gun having a socket to contain a cart-

ridge of explosive material; means for exploding said cartridge, so as to cause the force of the explosion to break down the material being mined directly upon said receiving element; an expansible device on
5 said gun for wedging engagement with the walls of said bore, to choke up the latter, to maintain the gun in place therein and to prevent blow-out therethrough; and

separate means for preliminarily and finally 10 expanding said device.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

ERNEST HUTTON.

Witnesses:

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T. R. MIDDLETON.