Sept. 13, 1949. G. A. BRECKER 2,481,814

CONNECTING SLEEVE FOR DYNAMITE CARTRIDGES

Filed Jan. 2, 1941

FIG.1.

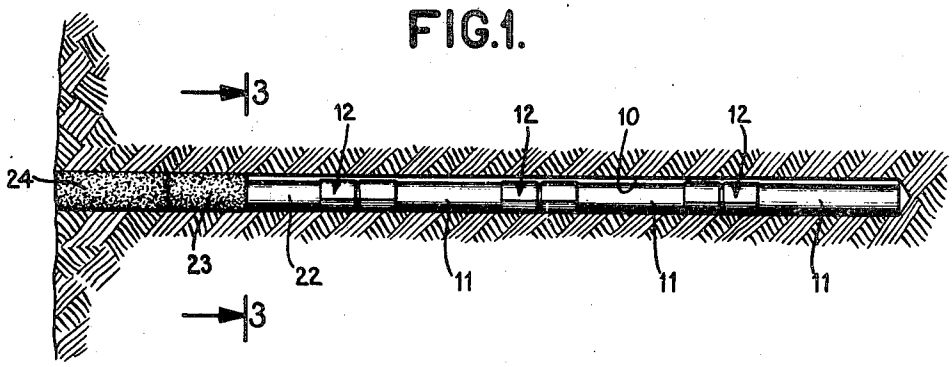


FIG.2.

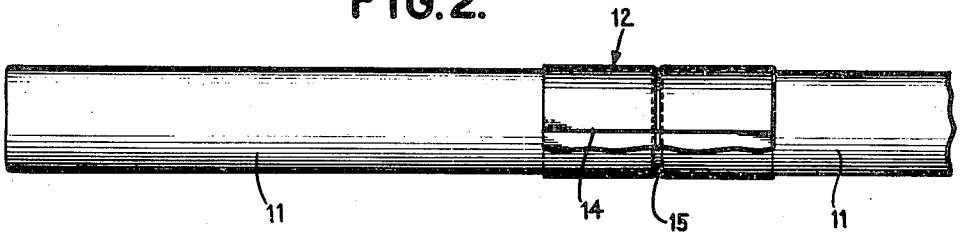


FIG.3.

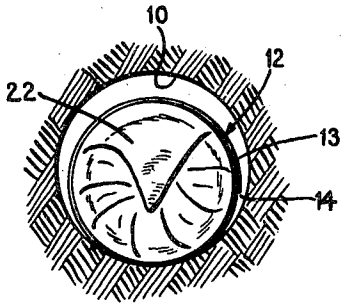
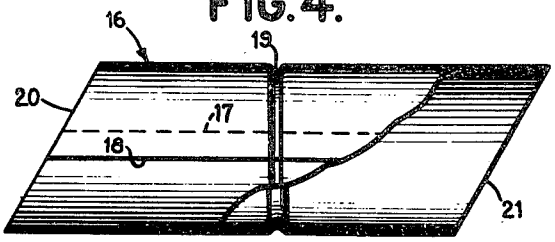


FIG.4.



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CONNECTING SLEEVE FOR DYNAMITE CARTRIDGES

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2 Claims. (Cl. 102—24)

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This invention relates to the use of dynamite sticks or cartridges in the blasting of coal or rock or the like.

A primary object of the invention has been to improve the effectiveness of sticks of dynamite or the like employed for blasting purposes and to eliminate the dangers and waste incident to burning and undetonated dynamite in bore holes.

Heretofore it has been a practice in certain fields in the blasting of coal or rock formations to slit the cartridges of dynamite throughout the whole or a portion of their length before they are inserted in the bore hole. Each stick is then tamped in place, after it is inserted, with the result that the sticks are partly crushed and expanded in diameter but reduced in length. This has various disadvantages. It serves to decrease substantially the desirable space around the stick which should form an air cushion for the transmission of a more uniform pressure force to the material to be blasted out. In reducing or eliminating the air cushion the explosion has a shattering effect upon localized areas with the result that the blast is not as effective for its intended purpose and produces excessive shattering of the lumps. Moreover, a larger number of cartridges than actually required to pull the cut satisfactorily will be inserted in a bore hole to bring the charge to the desired point adjacent the outer end of the hole when each of a series of sticks has been crushed by tamping.

Another serious objection to the common practice is that loose dirt, or borings, or the like, which may be present in the bore hole or may spall off the ribs of the bore hole or otherwise be formed or loosened as a result of the tamping operations, frequently becomes lodged between successive cartridges and forms an obstruction which interferes with or prevents proper propagation of the explosion. This causes either a misfire or a burning of the explosive with its consequent danger to human life and property.

In accordance with the present invention these objections and dangers are overcome by providing a special sleeve around the adjacent ends of successive cartridges forming a charge. These sleeves effectively prevent the lodging of dirt between the several sticks and thus insure the desired propagation of the explosion throughout the charge. Moreover, they eliminate the necessity of slitting, rolling and tamping the several cartridges so that the desirable air space around the charge is maintained to a maximum extent.

Other objects, features and advantages of the invention will appear from a detailed description

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of the same which will now be given in conjunction with the accompanying drawings in which:

Fig. 1 is a sectional view along the axis of a bore hole containing a connected series of dynamite cartridges in accordance with the invention.

Fig. 2 is an enlarged side view of a pair of adjacent cartridges, one being broken away in part, showing their connection in proper relation by a sleeve, the sleeve being partly indicated in section.

Fig. 3 is an enlarged end view of the bore hole taken along the line 3—3 of Fig. 1 before the stemming is introduced, and

Fig. 4 is an enlarged side view of a modified form of connectng sleeve which is partly broken away and shown in section.

Referring now to the drawings, a bore hole 10 is shown in Figs. 1 and 3, this being produced by drilling or the like and being of a conventional form, such as provided in a section of coal or rock to be blasted away. Within the bore hole there is provided a series of dynamite cartridges 11 which may also be of a conventional type. While the invention is not restricted to the employment of any specific form or size of explosive cartridge, the commonly used cartridges having a diameter of 1¼" and a length of 8" may be advantageously employed. The bore hole in that event should be about 1½" in diameter, although it may be somewhat smaller or larger, if desired, say, from 1⅜" to 1¾" in diameter. The length of the bore hole will, of course, vary with the particular formation to be blasted. Ordinarily, in the mining of coal, it will be found desirable to provide a bore hole of sufficient length to receive four of five cartridges end to end with sufficient space at the outer end to receive the primer and the required stemming.

For the purpose of retaining the series of cartridges in proper, contiguous relation, a sleeve, designated generally by the reference character 12, is provided around each pair of abutting ends of the successive sticks. These sleeves may be of any appropriate construction but should be readily destructible and are preferably formed of relatively thin, flexible material, such as paper, cloth, or the like. A closely woven fabric of about one hundredth of an inch in thickness and coated or impregnated with some stiffening agent, such as starch, casein, or the like, will be found quite satisfactory since it combines strength with toughness and stiffness and will add little to the diameter of the charge at the points of connection between the successive cartridges. The pa-

per or similar material of which the sleeves are formed has an inherent resilience which will permit the same to be readily opened up from a collapsed condition by the simple application of pressure by the fingers to the folded edges thereof.

The sleeve 12 may conveniently be formed as a single roll of sheet material having its longitudinal edges overlapped and these circumferentially overlapped portions united by adhesive means, stapling or the like. If the sleeve is formed of stiffer material, such as heavy paper or cardboard, it may be produced by spirally winding the paper into a tube which may then be cut into appropriate lengths to form the individual sleeves.

While the dimensions of the sleeve may be varied, it has been found desirable to employ a sleeve about 3" long and having an inside diameter only slightly larger than the outside diameter of the cartridges so that a relatively tight or snug fit is provided with the latter. This insures the proper retention of the sleeve by friction in the position in which it is applied to the cartridges.

In the use of the sleeves, the entire series of cartridges to form a particular charge may, if desired, be assembled with the sleeves and then inserted as a unit into the bore hole. However, it will ordinarily be preferable to apply a sleeve to one end of one cartridge, then introduce that cartridge part way into the bore hole, insert the end of another cartridge in the free end of the sleeve on the first cartridge, push the pair of assembled cartridges further into the bore hole, apply another sleeve to the free end of the second cartridge, insert a third cartridge into the free end of this sleeve, force the series of cartridges further into the bore hole and so on. To assist in correctly positioning the sleeves on the ends of the cartridges, they may suitably be provided with some indication of their central, transverse plane. For example, either the outer or inner surface of the sleeve may be provided with a circumferential line indicating the point to which each cartridge should be inserted, or a slight crease may be provided at the center of the sleeve, by folding the same at this point, for the same purpose. If the material of which the sleeve is formed is such that a groove or other indentation 15 may be provided, this will serve not only to indicate the proper location of the ends of the cartridges but it will serve as a definite stop against which the ends of the cartridges may be forced. In applying a sleeve with such a groove, the operator need not observe the extent to which the sleeve is applied to the end of a cartridge but may simply slip it over the end as far as it will go and similarly the next cartridge may be inserted in the free end of the sleeve and forced in as far as it will go. Moreover, a creased, or grooved, or otherwise indented sleeve will serve to hold the cartridges more firmly by virtue of the contraction of the wall in the region of the indentation.

Referring now to Fig. 4, a modified form of sleeve is shown which may be of any of the types of construction mentioned in connection with sleeve 12. It may, for example, comprise a single turn or roll of cloth or paper or the like having its longitudinal edges 17 and 18 overlapped and united by adhesive or other means to form a tube of circular cross-section. A crease or groove 19 or other means, such as described in connection with sleeve 12, may be provided to facilitate the

proper use of the sleeve. In lieu of having the ends of the sleeve cut at right angles to the axis, the planes of these ends 20 and 21 may conveniently be inclined or disposed at an acute angle to the axis. An angle of about 75° to the axis has been found quite satisfactory, although this angle is susceptible of wide variation. An advantage of the inclined or angular disposition of the end faces is that it assists in the application of the sleeve to the end of the cartridge. It is not necessary to fit the entire opening at the end of the sleeve over the cartridge at one time but the application may be started at the advance end of the face and carried gradually back toward the inward end of the face as the sleeve is forced over the cartridge. This enables the use of a tighter fit between the sleeve and cartridges without unduly increasing the difficulty of applying the sleeves.

If the sleeves are formed of flexible material, such as paper or fabric or the like, they may conveniently be pressed flat for purposes of packing and shipment. The walls of the sleeve may simply be pushed together and a dozen or a hundred or more of the sleeves may be packed in a relatively small space in a box. The modified form of Fig. 4 is particularly desirable from this standpoint since it facilitates the opening of the flattened sleeve into its more or less circular form and then forcing it over the end of a cartridge.

In making use of the sleeve in accordance with this invention, the series of cartridges 11 forming a charge, assembled with the sleeves 12 either completely outside of the bore hole or piece by piece at the mouth of the bore hole, in the manner explained, will be forced comparatively gently against the inner end of the bore hole. No tamping is necessary or desirable. Nor is packing required except in connection with heavy pitches for which just sufficient packing may be done to hold the cartridges in place. A primer cartridge 22, containing the detonator, is then gently pushed against the main charge. An additional sleeve 12 may be employed, if desired, to connect the primer with the last dynamite cartridge or this sleeve may be omitted. One stemming bag 23 is preferably employed at the outer end of the primer to hold it in place. The balance of the stemming 24 is then packed tightly in the outer end of the bore hole to insure the proper action of the charge.

In view of the protection afforded by the sleeves at the abutting ends of the successive cartridges, the danger of loose material falling between the cartridges to form an obstruction is completely eliminated and correct and complete propagation of the explosion through the unbroken column is insured. Moreover, since no tamping of the charge, and no slitting or rolling of the cartridges prior to insertion, is required, the air space around the charge within the bore hole is fully maintained so that a desirable cushioning effect is obtained.

While several preferred forms of sleeve construction and the preferred method of utilizing the sleeves have been described in considerable detail, it will be understood that numerous changes may be made in the construction of the sleeve and in the steps involved in its use without departing from the general principles and scope of the invention.

What I claim is:

1. An explosive device comprising a plurality of elongated explosive cartridges of substantially

equal length disposed coaxially in a continuous end to end abutting relationship, said cartridges having paper-like outer wrappings, and a plurality of tubular connecting sleeves formed of readily combustible, paper-like material surrounding the end portions of adjacent cartridges and extending across the joints therebetween, said sleeves being of such diameter as to frictionally retain the cartridges in a continuous series in abutting and explosion propagating relation, the wall thickness of said sleeves being such as not to add appreciably to the overall diameter of the charge and the material of said sleeves being flexible to permit collapsing thereof by the fingers when not in use but having sufficient stiffness and resilience to enable the same to be readily opened up from a collapsed condition by the simple applicaton of pressure by the fingers to the edges thereof.

2. As an article of manufacture a dynamite cartridge connecting member comprising a thin-walled sleeve formed of readily combustible, paper-like material adapted to surround the end portions of adjacent dynamite cartridges and extend across the joint therebetween, said sleeve being of such diameter as to frictionally retain the dynamite cartridges in a continuous series in abutting and explosion propagating relation, the wall thickness of said sleeve being such as not to add appreciably to the overall diameter of the charge and the material of said sleeve being flexible to permit collapsing thereof by the fingers but having sufficient stiffness and resilience to enable the same to be readily opened up from a collapsed condition by the simple application of pressure by the fingers to the folded edges thereof, the plane of each end of said sleeve being inclined at an acute angle to the axis of said sleeve,

whereby the sleeve may be shipped in collapsed condition and readily opened up and applied to the dynamite cartridges at the point of use.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
646,661	Hannstrein	Apr. 3, 1900
927,545	Johnson	July 13, 1909
1,368,490	Dieckmann	Feb. 15, 1921
1,386,770	Downey	Aug. 9, 1921
1,565,766	Weber	Dec. 15, 1925
1,761,820	Fabrizio	June 3, 1930
1,816,100	Ulrik	July 28, 1931
1,894,605	Wright	Jan. 17, 1933
1,898,297	Fox	Feb. 21, 1933
1,985,992	Hayman	Jan. 1, 1935
2,007,568	Heitzmann	July 9, 1935
2,014,464	Bierbach	Sept. 17, 1935
2,040,581	Voortmann	May 12, 1936
2,056,304	Sweet	Oct. 6, 1936
2,081,409	Rush	May 25, 1937
2,112,247	McLoughlin	Mar. 29, 1938
2,129,508	Slusser	Sept. 6, 1938
2,202,956	Lee	June 4, 1940
2,317,354	Bennett	Apr. 7, 1943
2,317,415	Smith	Apr. 27, 1943
2,456,332	Seyforth	Dec. 14, 1948
2,458,898	DiAddario	Jan. 11, 1949
2,459,321	Johnson	Jan. 18, 1949

FOREIGN PATENTS

Number	Country	Date
15,118	Great Britain	Oct. 20, 1888