Jan. 2, 1923. 1,440,601.

J. R. HOLRAN.

EXPLOSIVE CHARGE.

FILED JAN. 6, 1921.

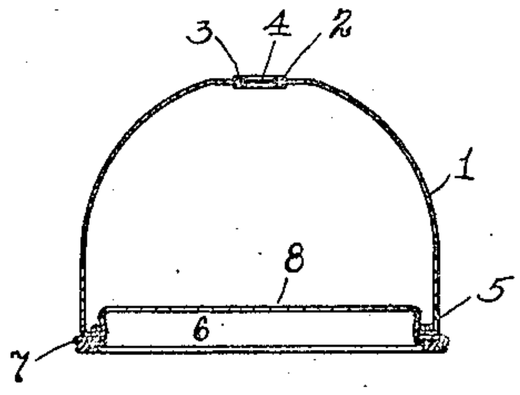

FIG. 1

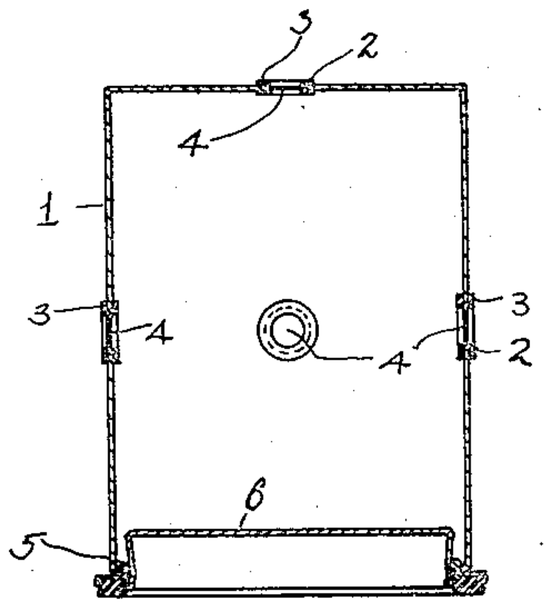

FIG. 2

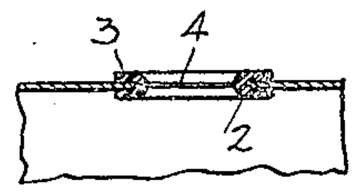

FIG. 5

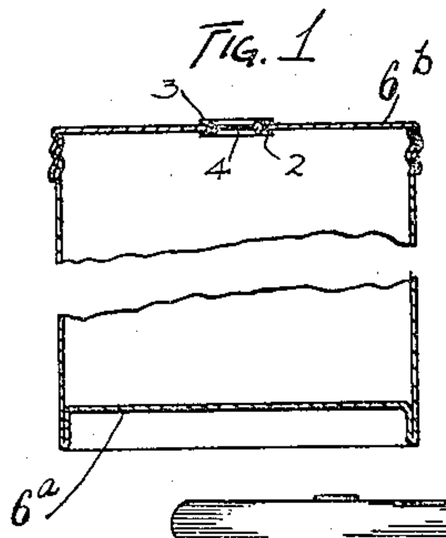

FIG. 2a

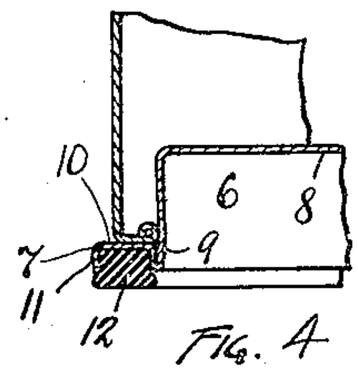

FIG. 4

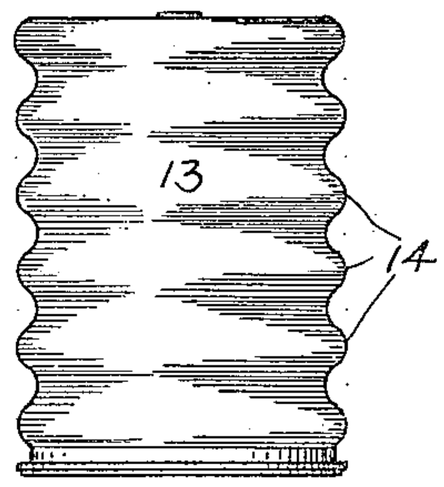

FIG. 6

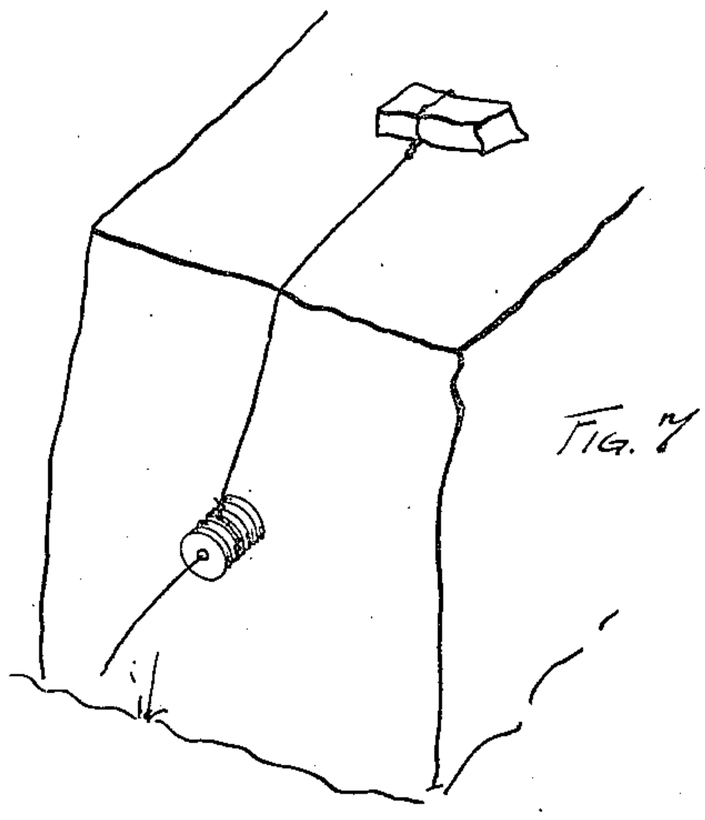

FIG. 7

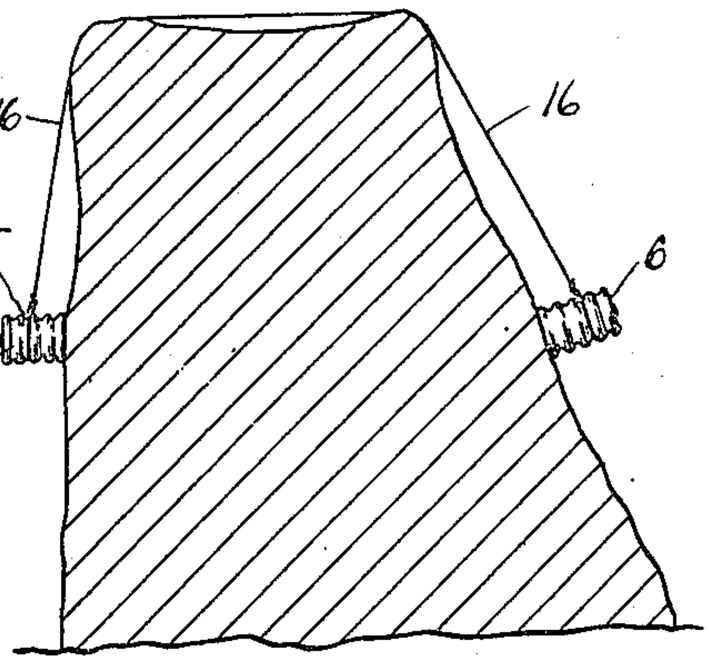

FIG. 8

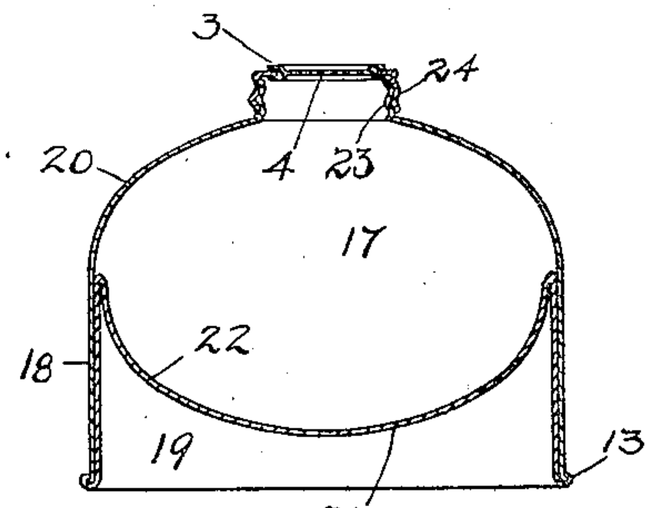

FIG. 3

Inventor

John R. Holran

By Fay, Oberlin & Fay.

Attorneys

Patented Jan. 2, 1923. 1,440,601

UNITED STATES PATENT OFFICE.

JOHN R. HOLRAN, OF LAKEWOOD, OHIO.

EXPLOSIVE CHARGE.

Application filed January 6, 1921. Serial No. 435,346.

To all whom it may concern:

Be it known that I, JOHN R. HOLRAN, a citizen of the United States, and a resident of Lakewood, county of Cuyahoga, and State of Ohio, have invented a new and useful Improvement in Explosive Charges, of which the following is a specification, the principle of the invention being herein explained, and the best mode in which I have contemplated applying that principle so as to distinguish it from other inventions.

The present improvements relate more particularly to an explosive charge designed for use in blasting operations wherein the charge is placed in surface contact with the objects, for example, a bowlder or large block of stone which is to be separated on a predetermined line of cleavage or to be shattered into fragments of a size which can be closely approximated. Ordinarily, dynamite is employed in such operations in the form of the familiar cylindrical cartridges in which it is regularly furnished. Thus applied for such an operation, in which the explosive cannot be confined, it is usual to place a layer of mud around one or more sticks of dynamite thus laid on the face of the object, the idea being that this increases the shattering effect of the explosion. For the blasting purposes above referred to and such analogous uses as will be apparent, I have devised a novel form of container wherein a dead air space is provided between the main body of the explosive charge and the surface of the object to which the explosive is to be applied. These containers are of several different kinds, the design being varied according to the special use to which the explosive is to be put. In each of them, however, the dead air space is utilized, and practical tests have demonstrated that a shattering or breaking, effect of about thirty percent (30 percent) or more above that obtained from an equal amount of explosive of the usual form is secured. The rim of the container rests against the surface of the object and encloses the dead air space which is formed between the surface of the object and the slightly elevated bottom of the container. The exact physical phenomena occurring at the time of the explosion it is impossible to accurately describe, although it would appear that this construction causes the explosive to deliver a hammer blow upon the object to which it is attached and that this hammer blow strikes at the central portion of the object a fractional time in advance of the blow upon the remaining portion. However, the explanation of the exact method by which the effect is secured is immaterial so long as the superiority of the results obtained by the use of my explosive charge is known and the construction and methods employed by me are clearly differentiated from the methods and explosive containers heretofore used. To the accomplishment of the foregoing and related ends, said invention, then, consists of the means hereinafter fully described and particularly pointed out in the claims.

The annexed drawing and the following description set forth but several of the various ways in which the principle of the invention may be employed.

In said annexed drawing:—

Figure 1 is a sectional side elevation of a standard form of my improved explosive charge or container; Figs. 2, 2ª and 3 are central vertical sectional views illustrating modified forms of the same; Figs. 4 and 5 are detail sectional views showing the base portion and the ignition point web member, respectively; Fig. 6 is a front elevation of still another modified form of the device; Fig. 7 is a perspective view showing the application of the form of my device illustrated in Figure 6 to the side of a large block of stone which it is desired to shatter; and Fig. 8 is a front elevation showing the object operated on in section and showing two of my containers of the form illustrated in Figure 6 applied to the opposite sides of said object, with a view to producing a fracture along a predetermined line of cleavage.

Whichever of the several forms of container thus illustrated be utilized, the material of which such container is made is a matter of indifference, forming no part of the present invention, so long as the container has the air space at the base thereof, and carries a charge sufficient to react upon such space as has been described above. Thus, such container may be made of cloth, fabric, paper, paste board, wood or metal, or a combination of two or more such materials, or may be of wholly frangible material or otherwise. In general, the form of my improved container may be varied to suit the purpose for which the charge is to be used. Thus, as shown in Fig. 1, the container 1 is flat at its base and dome-shaped as to its upper portion, while in Figs. 2 and 3, the upper portion has a flat top and may be cy-

lindrical or of any other form desired. A very effective form of container, as shown in Fig. 3, is one having an explosive chamber of elliptical cross-section, supported about its central periphery by a cylindrical wall portion. In Fig. 6, a cylindrical container having a flat top and corrugated sides is illustrated, the corrugations assisting in the proper positioning of the container against the sides of an object, as is illustrated in Figs. 7 and 8, described more fully later. It is to be understood that the several dimensions of the container and corresponding therewith the various weights of explosives which it holds, may be varied to suit the purpose in hand. In particular, the dead air space, or "striking gap," as I prefer to term the same, at the bottom end of the container, may be varied in shape and volume to secure different effects.

As illustrated in Figs. 1, 2, 2[a] and 3 particularly, the body of the container 1 is provided centrally of its upper side with an aperture 2, through which the fuse or detonating cap is inserted, and one or more similar apertures similarly closed may also be provided in the lateral wall of the container, as shown in Fig. 2, for a purpose presently to be explained. When a plurality of such apertures are provided in the side, they are preferably equidistantly spaced about the container body. A closure 3 for these apertures is provided, which consists of a web 4 of rubber, paper or any relatively easily puncturable material of such nature that it will afford sufficient friction when punctured to hold a cap or fuse in place, and having an edge conformation that permits it to be crimped upon the edges of such aperture. The base of the body portion is provided with a fold or bead 5, depending upon the material used, to strengthen it at this point and permit of the tight engagement therewith of the base portion.

In the forms shown in Figs. 1, 2 and 3, the base portion 6 of the container is removable, and comprises a rim portion 7 and a central portion 8, which latter, as illustrated in detail in Fig. 4, may have the rim portion formed about the central portion by having the said material of which it is constructed bent backwardly upon itself, as shown at 9, for a short distance, and then outwardly parallel to the bottom, as shown at 10, of said central portion, and then toward the observer, as shown at 11, at its outer edge to a distance equal to the depth of the bent back portion referred to. Within the channeled portion of the rim formed as above described, is then inserted a resilient member 12 of rubber or similar material, which is designed to create friction on the bottom of the container so as to tend to keep the latter from sliding or slipping when placed on a smooth slanting surface.

In the modified form shown in Fig. 2[a], instead of the lower end 6[a] of the container being removable it is formed integral with the body, and the upper end 6[b] consists of a removable, e. g. screw-threaded, closure, to permit the container to be filled. In Fig. 6 a container 13 of cylindrical form is shown, but provided with encircling corrugations 14, in the depressed portions 15 of which may be placed a cord, wire or other suspending means 16, which, as illustrated in Figs. 7 and 8, may be used to position the charge of the container at any desired location upon the side of the object to be operated upon. In the form shown in Fig. 3 an explosive containing chamber 17 of elliptical cross-section is supported about its central periphery by a cylindrical wall portion 18 and this provides an air space 19 of smaller vertical depth centrally than at its marginal portions. To form this container I use a cylindrical member 20 having a dome-shaped top provided centrally with a charge inserting aperture about which is formed an upstanding sleeve or collar 23 provided with screw threads, over which is adapted to be engaged a cap 24. The cap is provided centrally with a charge igniting aperture provided with a closure of the character already described. Within the base of the top member I telescope an inner member 21 having a cylindrical body to fit closely the cylindrical portion of the outer member. The top of this section is provided with a depressed portion 22 of a curvature to correspond with the dome-shaped top of the outer section and together therewith to form the explosive containing chamber of elliptical cross-section 17. The lower edge of the inner section is provided with an outwardly turned beading 13 within which the lower edge of the outer section is tightly engaged.

My invention is of particular value in separating large blocks of stone, which have been previously quarried, into smaller blocks of a size which can be predetermined with a reasonable degree of accuracy. Where a very large block is to be thus reduced in size, it is usual to search for some natural line of cleavage in the material and place a number of cartridges, preferably of the design shown in Fig. 6, against the stone on the line of cleavage referred to. In this way, the result desired can be attained with the use of a minimum amount of powder.

In any of the forms illustrated, the charge required for a particular amount of work is very much smaller than that necessary for an equivalent result by other means. While surface blasting has been particularly referred to in this description, it is not intended to imply limitation in the use of this cartridge for any blasting operation wherein it would be effective. Thus, a slot or channel-way may be found in the native bed,

or in concrete or other material which it is desired to dislodge, and cartridges embodying my principle of a "striking" gap may be made of suitable form for use in such situation. Furthermore, by use of the lateral apertures in the body of the container fuses loaded with T. N. T., or equivalent high explosive of great velocity, may be used to connect a plurality of charges, either closely spaced or spaced more or less remotely from each other, and all be caused to explode practically instantaneously from a single point.

Other modes of applying the principle of my invention may be employed instead of the one explained, change being made as regards the mechanism herein disclosed, provided the means stated by any of the following claims or the equivalent of such stated means be employed.

I therefore particularly point out and distinctly claim as my invention:—

1. An explosive charge comprising an explosive element, a container for the explosive element having one face of substantial area, and means associated with said container spacing said face of the explosive charge from the object to which it is to be applied.

2. An explosive charge for surface blasting comprising an explosive element, and a container for said element having a flat face of substantial area and having structural members spacing said face of the explosive element from the object to which it is to be applied.

3. An explosive charge for surface blasting comprising an explosive element, a container therefor and an air confining means adjacent a face of said container of substantial area.

4. An explosive charge comprising an explosive element, a pair of telescopic members of greater horizontal than vertical extent for supporting said explosive element, one of said members having a portion forming the upper element of an explosive containing chamber and the other of said members forming the lower element of the explosive containing chamber and the upper member of an air confining means.

5. An explosive charge comprising an explosive element, a pair of telescopic members for supporting said explosive element, one of said members having a portion forming the upper element of an explosive containing chamber, the other of said members forming the lower element of the explosive containing chamber and the upper member of an air confining means, and a contact rim upon one of said members adapted to be placed closely against the object to be shattered.

6. An explosive charge comprising an explosive element, a pair of telescopic members for supporting said explosive element, one of said members having a portion forming the upper element of an explosive containing chamber, the other of said members forming the lower element of the explosive containing chamber and the upper member of an air confining means, and a contact rim of elastic material upon one of said members adapted to be placed closely against the object to be shattered.

7. An explosive charge comprising an explosive element and a pair of telescopic members for supporting said explosive element, one of said members having a dome-like end and a cylindrical body portion, the other of said members having an inverted dome-like end and a cylindrical body portion of a size to fit within the cylindrical body first mentioned thereby providing an explosive receiving chamber and a re-inforced supporting wall forming a dead air space adjacent said explosive receiving chamber.

8. An explosive charge comprising an explosive element and inner and outer members in telescopic engagement for supporting said explosive element, one of said members having a done-like end and a cylindrical body portion, the other of said members having an inverted dome-like end and a cylindrical body portion, the lower edge of said inner member being upwardly turned to closely engage the lower edge of the outer member.

9. An explosive charge comprising an explosive element and inner and outer members in telescopic engagement for supporting said explosive element, one of said members having a dome-like end and a cylindrical body portion, the other of said members having an inverted dome-like end, a cylindrical body portion, and an explosive ignition aperture centrally of said dome-like portion.

10. An explosive charge comprising an explosive element and inner and outer members in telescopic engagement for supporting said explosive element, one of said members having a dome-like end and a cylindrical body portion, the other of said members having an inverted dome-like end, a cylindrical body portion, an explosive ignition aperture centrally of said dome-like portion, and an easily perforable closure for said ignition aperture.

11. A closure for an ignition aperture of an explosive container comprising a web-like member of easily perforable material having a channeled peripheral portion adapted to be crimped upon the edges about said ignition aperture.

Signed by me, this 3rd day of January, 1920.

JOHN R. HOLRAN.