Dec. 20, 1966 J. H. CHURCH ETAL 3,292,536

SHAPED EXPLOSIVE CHARGES

Filed April 25, 1950

Fig. 1.

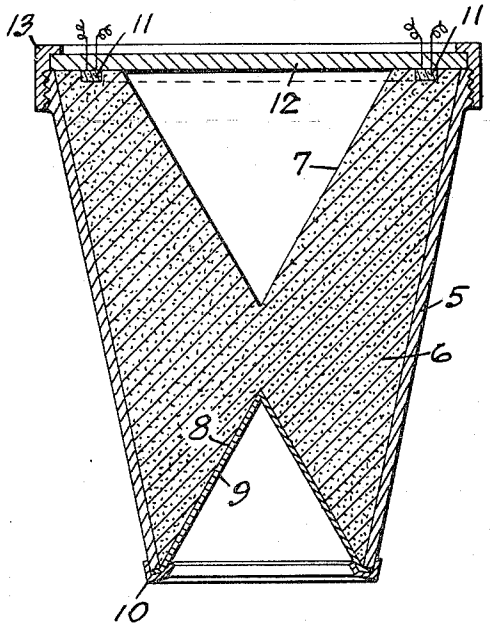


Fig. 2.

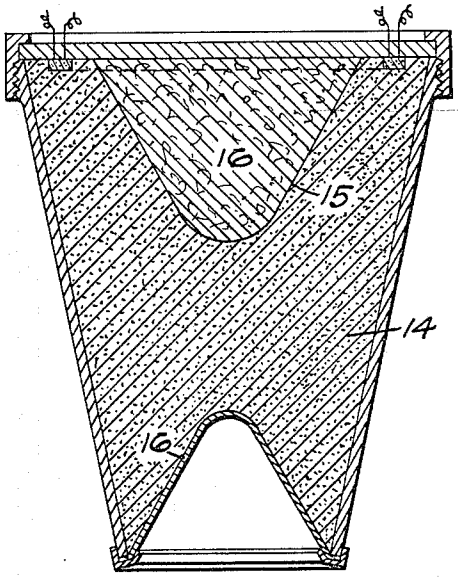


Fig. 3.

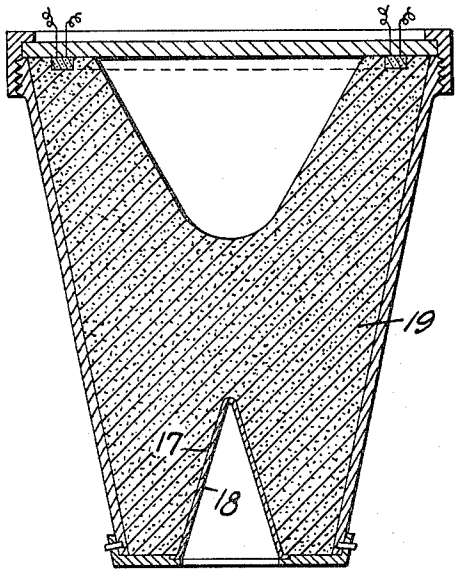
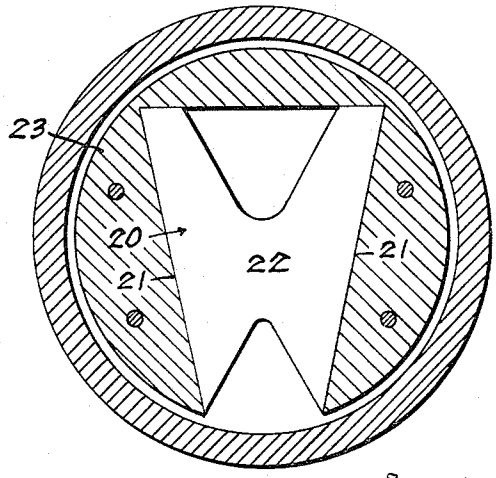


Fig. 4.



Inventors

Joseph H. Church

Gregory J. Kessenich

By G. J. Kessenich & J. H. Church

Attorneys

United States Patent Office

3,292,536

Patented Dec. 20, 1966

3,292,536

SHAPED EXPLOSIVE CHARGES

Joseph H. Church, Austin, Minn., and Gregory J. Kessenich, Madison, Wis., assignors to the United States of America as represented by the Secretary of the Army

Filed Apr. 25, 1950, Ser. No. 158,050
1 Claim. (Cl. 102—24)

The invention described in the specification and claims may be manufactured and used by or for the Government for governmental purposes without the payment to us of any royalty thereon.

This invention relates to a shaped explosive charge.

In the employment of lined hollow or shaped explosive charges it has long been known that maximum penetration of a target is obtained when the striking gap or stand-off distance from the target has a predetermined value dependent on the characteristics of the particular change and liner. In the military and industrial applications of explosives, situations occur where the explosive charge is to be used in confined areas and restricted spaces and must accordingly be limited in size and so placed that the optimum relationship between stand-off and penetration must be ignored or compensated for.

Illustrations of such restricted applications are found where the explosive charge is placed within a tube and is to function axially of the tube as in U.S. patents to Watson 1,534,011, 1,534,012 and Woodberry 1,810,000 or is to function transversely of the tube as in Mims 1,582,184 and Davis 2,399,211.

The purpose of the invention is accomplished by arranging the explosive unit so that the force of the explosion is effectively directed against the sides of the shaped liner.

The invention is illustrated in the accompanying drawings, in which

FIG. 1 is a vertical sectional view of one form of the invention.

FIGS. 2 to 4 are sectional views of other forms.

In FIG. 1 there is shown a frusto-conical or truncated container **5** for carrying the explosive charge . The base or rear end of the charge is formed with a conoidal cavity **7** having a relation to the conical wall of the container so that the cross-sectional area of the charge at the base is approximately equal to its cross-sectional area at the apex of the cavity.

The front end of the charge is likewise formed with a conoidal cavity **8** receiving a complementary liner **9** retained in any suitable manner as by the ring **10**. The dimensions and angle of the cavity and liner may be varied as is well understood in the art of shaped charges. In the illustration parameters are selected which afford an appreciable spacing between the apices of the cavities **7** and **8**.

The explosive charge is initiated at its base in any convenient manner, as by detonators **11—11**. A cover plate **12** confining the annular base of the charge **6** may be retained by a ring **13**.

In operation when the charge is initiated, the detonation wave travels a converging path on an annular front until it reaches the apex of the cavity **7**, where in changing from an annular to a circular front it produces accelerated and intensified action along the periphery of the charge. The directional effect on the detonation wave, imparted by the convergence or cavity **7**, causes the wave front to strike the sides of the liner **9** approximately normal to these surfaces and obliquely or frontally in the direction of the liner axis. The detonation waves striking with uniformity and maximum force will eliminate the irregularity which occurs when the wave front moves axially of the charge and strikes the liner laterally.

In FIG. 2 the charge **14** is formed with a base cavity **15** and a front cavity **16**, each having a rounded apex. This arrangement increases the spacing between the apices. Obviously either one of the cavities may be as shown in FIG. 1. In this form of the invention the base cavity **15** is filled with an inert substance or member **16** which serves as a positive deflecting agency to guide the detonation wave. The provision of the solid guide member lends itself to adaptation for use in cylindrical charges as covered in application for patent application Serial No. 160,206 filed May 5, 1950, and now abandoned.

In FIG. 3 the front cavity **17** and liner **18** have a sharper angle to permit the explosive charge **19** to extend to and surround the base of the liner.

In FIG. 4 the charge **20** is shown as a linear charge with converging side walls **21—21** and parallel faces **22** only the upper one being shown. The charge is conveniently carried in a casing **23** which may be inserted in a tubular member, such as a gun barrel, whose wall is to be perforated.

The invention is also applicable to an explosive charge without a liner in the front cavity.

We claim:

In a shaped explosive charge, a frusto-conical container tapering from its rear end forwardly and having a longitudinal axis of symmetry, a solid block of explosive filling said container and having first and second discrete generally conical cavities therein opening through the forward and rearward faces of said explosive block, respectively, both said cavities being symmetrical about said axis and having their apices spaced along said axis, a liner fitting said first cavity and united about its periphery with the forward periphery of said container, detonator means associated with said block at and about the outer periphery of the base of said second cavity, an inert deflector filling said second cavity, a circular cover plate fitting over and covering said second cavity, said detonator means being annular and surrounding the base of said second cavity, and means securing the rearward periphery of said container with the periphery of said plate.

References Cited by the Examiner

UNITED STATES PATENTS

2,494,256	1/1950	Muskat et al.	102—24
2,622,528	12/1952	Lawrence	102—24
2,699,721	1/1955	Klotz	102—20

FOREIGN PATENTS

610,106	10/1948	Great Britain.

OTHER REFERENCES

Clark, American Institute of Mining and Metallurgical Engineers, Technical Pub. No. 2157, page 7, March 1947.

McLemore, The Oil and Gas Journal, Dec. 28, 1946, pp. 268–271.

BENJAMIN A. BORCHELT, *Primary Examiner.*

WILLIAM WILES, ARTHUR M. HORTON, SAMUEL BOYD, *Examiners.*

R. L. CAMPBELL, R. F. CUSTARD, V. R. PENDEGRASS, *Assistant Examiners.*