

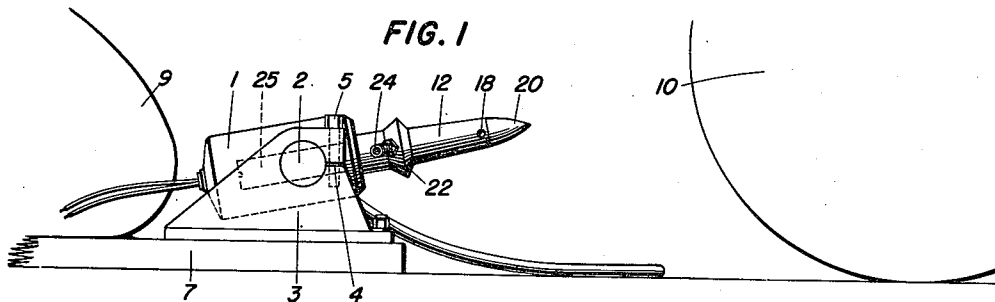
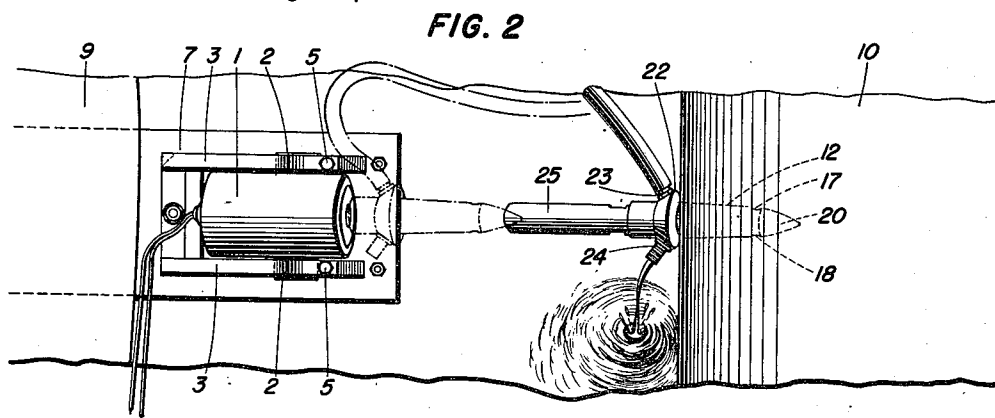
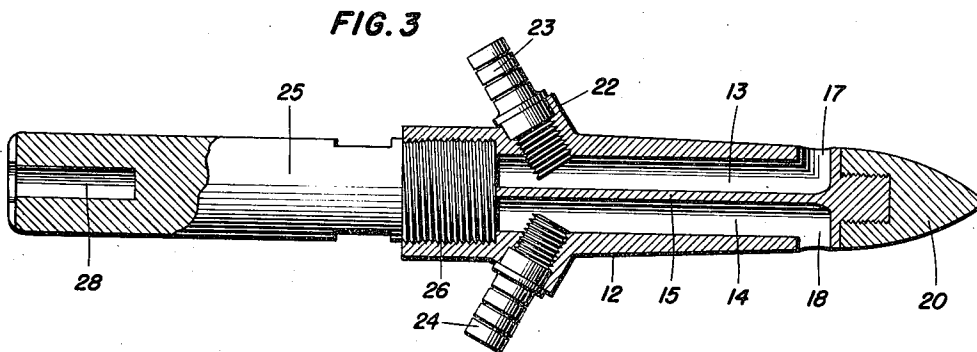
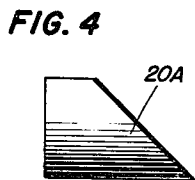
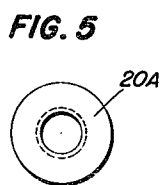
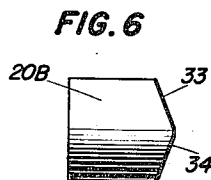
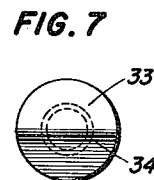
Dec. 20, 1949

C. S. PIGGOT ET AL
METHOD AND MEANS TO SAFELY DEACTIVATE
EXPLOSIVE BEARING ORDNANCE

2,491,516

Filed Jan. 12, 1944

3 Sheets-Sheet 1



INVENTORS
CHARLES S. PIGGOT
BY CARROLL C. MISENER
ATTORNEY

Dec. 20, 1949

C. S. PIGGOT ET AL
METHOD AND MEANS TO SAFELY DEACTIVATE
EXPLOSIVE BEARING ORDNANCE

2,491,516

Filed Jan. 12, 1944

3 Sheets-Sheet 2

FIG. 8

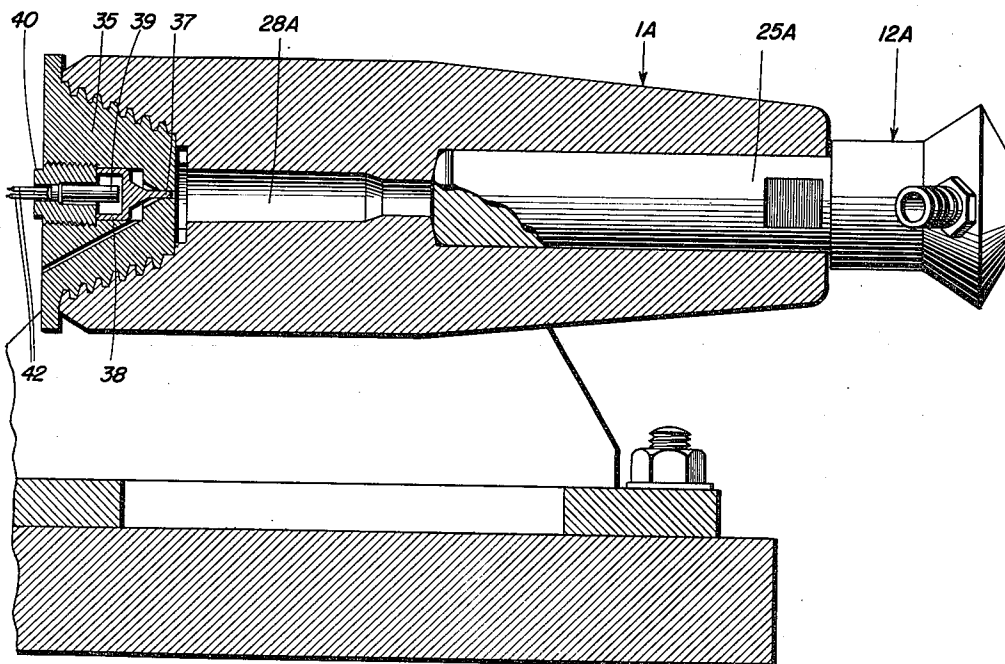


FIG. 9

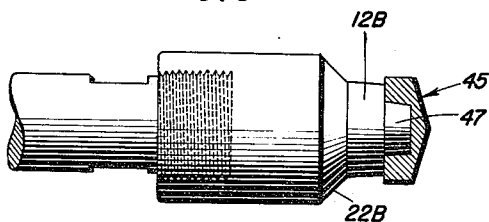


FIG. 10

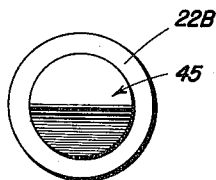
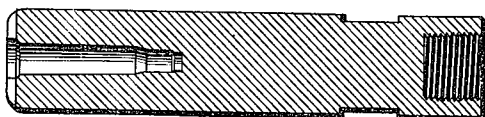


FIG. 14



INVENTORS
CHARLES S. PIGGOT
CARROLL C. MISENER
BY *Attorney*
ATTORNEY

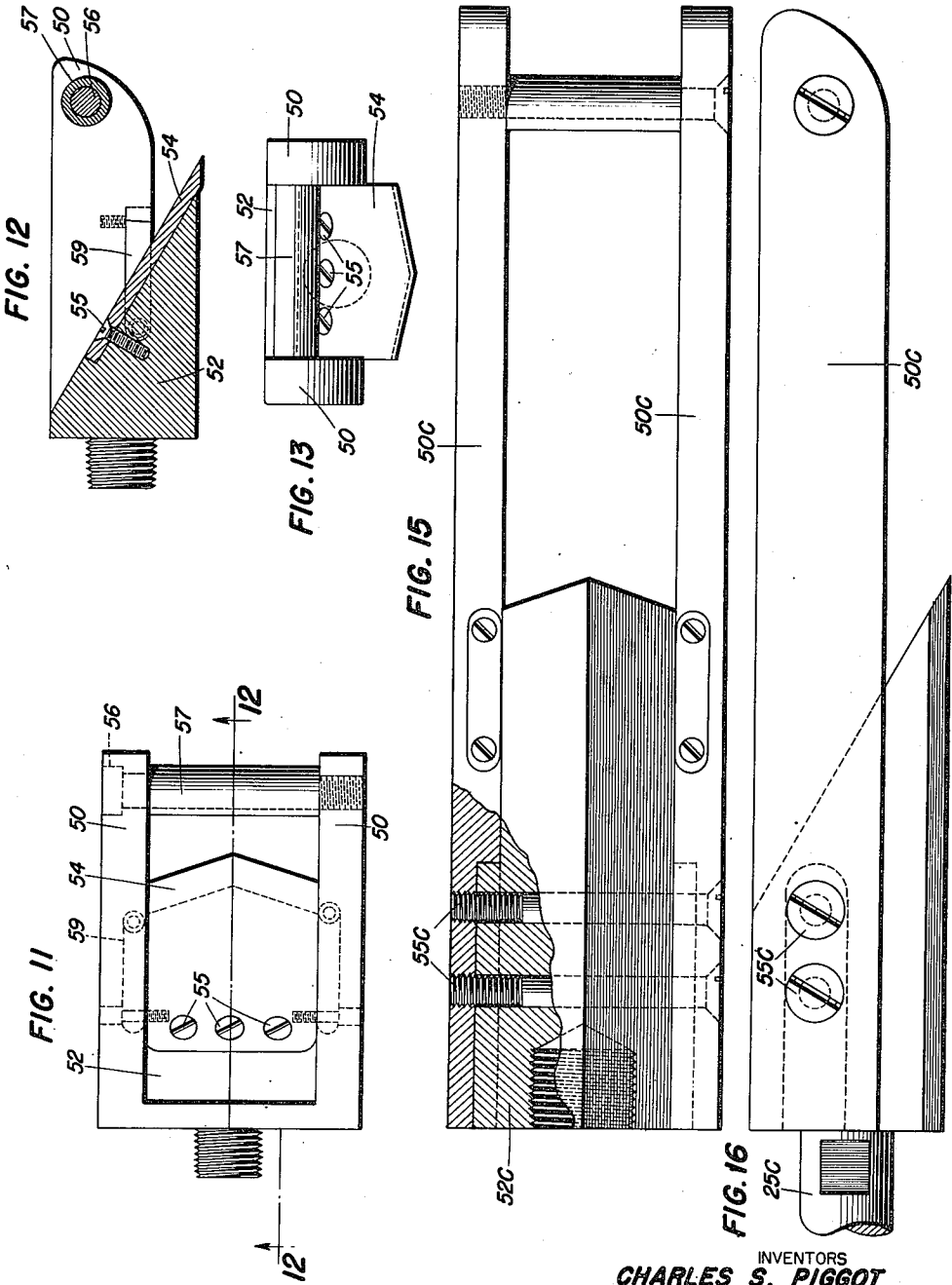
Dec. 20, 1949

C. S. PIGGOT ET AL
METHOD AND MEANS TO SAFELY DEACTIVATE
EXPLOSIVE BEARING ORDNANCE

2,491,516

Filed Jan. 12, 1944

3 Sheets-Sheet 3



INVENTORS
CHARLES S. PIGGOT
CARROLL C. MISENER
BY *971* **ATTORNEY**

UNITED STATES PATENT OFFICE

2,491,516

METHOD AND MEANS TO SAFELY DEACTIVATE EXPLOSIVE BEARING ORDNANCE

Charles S. Piggot and Carroll C. Misener,
Washington, D. C.

Application January 12, 1944, Serial No. 517,992

10 Claims. (Cl. 86—1.5)

(Granted under the act of March 3, 1883, as
amended April 30, 1928; 370 O. G. 757)

1

This invention relates to an improved process of, and apparatus for, gaining access to the interior of casings containing high explosives, such as the casings of mines and other explosive-bearing ordnance.

An important object of the invention is to enable the forming of openings of substantial size in such casings by means which are quickly and easily operable from a remote point in a manner virtually insuring the safety of disposal personnel.

Another object is to provide improved means involving the use of relatively light and simple apparatus which is easily portable, and which may be quickly set up and quickly operated, the arrangement being such that in order to set up the necessary apparatus, it is not necessary for personnel to remain in the presence of the explosive-bearing ordnance for more than a very few minutes, thus greatly reducing danger to personnel in the event the explosive-bearing ordnance happens to contain a time delay fuze.

Another object of the invention is to provide such apparatus constructed and arranged not only to enter the casing but to permit removal of the explosive contents of the casing in a rapid, safe and effective manner, and which furthermore permits performing such removal operation while all personnel still remains at a distance, if desired.

A further object is to provide an improved tool for entering the casing of explosive-bearing ordnance, and for removing the explosive contents thereof, which tool is adapted to be projected by means of an explosive propellant, and to penetrate the casing to a predetermined degree, the tool being further provided with means whereby a solvent or other suitable means for removing or rendering the explosive harmless, may be introduced into the interior of the case, and which is furthermore so arranged that the explosive may, if desired, be liquified and caused to run from the casing through the tool itself.

Still another object is to provide such a tool which is usable in almost any position and under conditions such that only a portion of the casing of the explosive-bearing ordnance may be accessible.

An object related to that last stated is to provide such a tool which is adapted to form an opening in a lower portion of such a casing, whereby gravity may assist in the removal of the explosive contents.

In the drawing, showing preferred embodiments of our invention and wherein like reference

2

characters designate similar parts throughout the several views:

Figure 1 is a partly diagrammatic side elevational view of a mortar and a tool projectable therefrom and constructed and adapted to be used in accordance with the present invention, fragmentarily showing a portion of a mine casing in connection with the de-arming of which the tool is to be used.

Figure 2 is a plan view of the same, showing the projectile after firing and indicating the position which it then occupies with respect to the mine casing.

Figure 3 is a view partly in substantially diametric longitudinal section and partly a side elevation of a projectile tool constructed in accordance with the present invention.

Figures 4 and 5 are side elevational and rear end views respectively of a modified projectile nose adapted to be substituted for that shown in Figure 3.

Figures 6 and 7 are side elevational and front end views respectively of another modified projectile nose adapted to be substituted for that shown in Figure 3.

Figure 8 is a longitudinal sectional view of a cannon-type projecting means, fragmentarily showing the projectile tool in position for firing.

Figure 9 is a fragmentary side elevational view of a projectile tool of somewhat modified form.

Figure 10 is a front elevational view thereof.

Figure 11 is a plan view of a tool of another modified construction.

Figure 12 is a longitudinal sectional view taken substantially on the line 12—12 of Figure 11 and looking in the direction of the arrows.

Figure 13 is a front end elevational view of the same.

Figure 14 is a longitudinal sectional view of the shank of the tool of this embodiment.

Figure 15 is a plan view, partly broken away, of a tool of another somewhat modified construction.

Figure 16 is a side elevational view thereof fragmentarily showing the shank.

Referring now to the drawings, reference character 1 designates the barrel of the mortar, which is supported by trunnions 2 in the side plates 3, which form the carriage, plates 3 being split, as indicated at 4, adjacent the trunnions and provided with clamping cap screws 5. Loosening the cap screws permits pointing the gun, which may then be fixed in elevation by tightening the bolts. The mortar assembly is shown as bolted to a wooden base 7, and a sandbag 9 may be

3

used to assist in positioning the mortar during firing. A mine casing is fragmentarily represented at 10.

A preferred form of projectile is shown in Figure 3. It consists of a longitudinally tapered body portion 12, having a pair of longitudinal passages 13—14 therein separated by a partition 15 and each having a lateral orifice or ports as 17—18 opening to the exterior near the forward end thereof. The nose of the projectile is formed as a threadedly attached and replaceable portion 20 shown in Figure 3 as of conventional ogival shape.

A flared frusto-conic abutment portion 22 to the rear of the tapering section 12 limits penetration of the projectile, and the nipples 23—24 extending through ports in the abutment portion provide communication with the rear ends of the passages 13—14.

A shank 25 is threadedly attached to the body of the projectile as indicated at 26, the rear end of the shank being chambered at 28 to receive a blank shotgun shell which furnishes the propelling charge.

All portions of the mortar and projectile are preferably formed of non-magnetic materials to prevent unwanted detonation of the explosive in event magnetically operable firing means should be incorporated therewith.

Where it is desired to penetrate the casing in a line substantially perpendicular to the plane of the casing, or to the plane of tangency, at the point of entry, the ogival nose 20 illustrated in Figure 3 is of appropriate shape. Where it is desired to penetrate a case on an inclined or non-radial line, as near the bottom of a mine case, the chisel-shaped nose 20A illustrated in Figures 4 and 5 is preferable, and may readily be substituted.

Where it is desired to punch a section from the body of the case, a tool as 20B, of the contour indicated in Figures 6 and 7, having a front face formed of two planar surfaces 33, 34, intersecting at an obtuse angle along a diametrical line, as indicated, functions effectively.

In the somewhat modified construction shown in Figure 8, a breech loaded gun 1A is provided, chambered at 28A to receive a metallic blank cartridge. A screw type breech plug, 35, is employed carrying a simple radially slidable firing pin 37 having a cupped rear portion 38 forming a chamber for the gases generated by the firing squib 39 which, when fired, projects the pin 37 against the percussion cap of the cartridge (not shown) to fire the same. The firing squib may be retained by a simple screw plug 40 and electrical connections 42 are provided to permit firing the same from a distance. The tool, itself, the body of which is generally designated 12A, may be of similar construction to that first described, although the shank 25A may, of course, be solid rather than chambered.

In Figures 9 and 10 a somewhat modified tool is shown, designed to punch sections from a casing into which it is projected, and having a head or nose portion 45 the front face of which is generally similar to that of the embodiment shown in Figures 6 and 7. The head, however, is merely frictionally positioned upon the forwardly projecting boss 47 carried by the tool body 12B. The tool is also provided with a flared abutment portion 22B adapted to limit the extent to which it penetrates the case. The head 45 is of greater diameter than the shank 12B, and therefore forms a hole large enough to permit

4

easy removal of the shank, the head being left inside the penetrated case. The head is thrown free of the body of the tool when the motion of the latter is arrested by the abutment section 22B. This form of the invention will be recognized as most convenient for use in punching inspection holes.

It will be appreciated that it is often desirable to form an opening in the casing of such an explosive item of ordnance as near the bottom as possible, to enable as much of the explosive contents to run from the bottom of the casing under the influence of gravity as possible when it is subjected to a melting, washing or other removal operation.

It will be understood that the more inclined is the line of fire of the tool with respect to the casing, the greater the likelihood that the tool will glance from the casing rather than penetrating the same. It is of course desirable to form as large an opening as possible, under most conditions. Where a chisel-shaped tool, such as that illustrated in Figure 4 is employed, the casing tends to deflect the entering tool inwardly (toward a radial line if the case is curved) thus limiting the size of the opening formed.

It will be apparent that if such a chisel-shaped tool could be made to continue in a substantially straight line, rather than digging or swerving into the casing, a much larger opening could be formed by firing the tool very obliquely in a manner to strip a section from the case. The modified chisel-shaped tool illustrated in Figures 11 to 14, inclusive, is designed to function in the manner last indicated. It is provided with guiding means adapted to prevent the tool from digging or swerving into the casing as a result of the turning action of the inclined chisel surface. As best illustrated Figures 11 and 12, the body of this form of the tool comprises a pair of spaced forwardly projecting arms 50, between which is a shorter chisel body 52 which may be integral with the arms. A chisel blade 54 may be attached to the sloping forward face of the chisel body, as by means of screws 55, and cross bracing means may be provided for the guide arms 50, in the form of the transverse screw 56 and its surrounding spacer bushing 57. Hardened shear plates 59 may be carried by the lower surfaces of the guide arms 50 in the area subjected to the greatest wear due to the shearing action of the tool as the metal of the case is forced upwardly between the side arms 50 by the inclined top surface of the blade.

As indicated in Figures 15 and 16, the guide arms, as 50C, may be considerably longer than the guide arms 50 illustrated in Figures 11 and 12. This is advantageous in firing from a greater distance, or where the tool is to be used upon a casing of greater radius. Other portions of this tool will be seen to be similar to those of the last described embodiment, the guide arms 50C, however, being formed separately, and the chisel body 52C also being formed of a separate block. These three main sections are clamped together by heavy screws 55C, and the shank 25C is threaded into the rear end of the chisel block. In this embodiment also, the chisel block or the area thereof near its cutting edge may be hardened so that a separate blade is not required.

While it will be apparent that the preferred embodiments of our invention herein described are well calculated to fulfill the objects and advantages primarily stated, it will be apparent that the invention is susceptible to variation, modification

5

and change within the spirit and scope of the subjoined claims.

The invention herein described may be manufactured and used by or for the Government of the United States of America for governmental purposes without the payment of any royalties thereon or therefor.

We claim:

1. A projectable tool for use in removing explosive from a casing, said tool comprising a body portion having a piercing nose adapted to penetrate such a casing, abutment means carried by said body portion for limiting the extent to which the tool penetrates the casing, portions carried by said body portion defining a pair of longitudinal passages, and also defining a pair of ports each communicating with the surface of the body portion in a forward area thereof and one connected to each of said passages, and portions defining a pair of additional ports one communicating with each of said passages and each communicating with the exterior of the body portion in an area on the other side of said abutment means from said forward portion.

2. In combination with a casing substantially filled with explosive material, means for forming an opening in the casing without detonating the material, comprising a projectable tool including a shank, explosive-actuable means adapted to react against the shank to project the tool, a chisel-shaped piercing head carried by the shank, and guide means appurtenant the chisel-shaped head for controlling the path of the tool after it has impacted such a casing.

3. In combination with a casing substantially filled with explosive material, means for forming an opening in the casing without detonating the material, comprising a projectable tool including a shank, explosive-actuable means adapted to react against the shank to project the tool, a cutting head carried by the shank, and guide means appurtenant said cutting head and projecting forwardly and to one side thereof to engage a casing against which the projectile is fired and to guide the cutting head in a desired path with respect to such casing.

4. In combination with a casing substantially filled with explosive material, means for forming an opening in the casing without detonating the material, comprising a projectable tool including a shank, explosive-actuable means adapted to react against the shank to project the tool, a cutting head carried by the shank comprising a chisel portion, and a pair of laterally spaced shearing portions appurtenant said chisel portions for assisting in separating the portion of the casing on the side of the area thereof entered by the chisel portion.

5. In combination with a casing substantially filled with explosive material, means for forming an opening in the casing without detonating the material, comprising a projectable tool including a shank, explosive-actuable means adapted to react against the shank to project the tool, a cutting head carried by the shank comprising a chisel section, and a pair of shearing portions arranged to cooperate with the sides of the chisel section to shear a strip conforming to the effective width of the chisel from a casing entered by the chisel when the tool is projected obliquely against the surface of such a casing.

6. In combination with means as set forth in claim 5, guide means projecting forwardly of said chisel portion substantially parallel to an axis

6

corresponding to the line of fire and spaced laterally from the cutting edge of said chisel portion.

7. In combination with means as set forth in claim 5, guide means projecting forwardly of said chisel section substantially parallel to an axis corresponding to the line of fire and spaced laterally from the cutting edge of said chisel section, said shearing portions being carried by said guide portions.

8. The method of rendering harmless an enclosed item of explosive-bearing ordnance that comprises the steps of directing at said ordnance from a remote position the nose of an elongated projectile the body portion of which is provided with a longitudinal passage having longitudinally spaced ports communicating therewith, attaching a flexible conduit to a port communicating with said passage spaced rearwardly of said nose, propelling said projectile from said remote position to pierce the casing of said ordnance, stopping the penetration of said projectile at a location adjacent said port, and thereafter circulating an explosive reacting fluid through said conduit, said ports and said passage.

9. An apparatus for safely deactivating items of ordnance comprising an elongated tool adapted to be fired from a gun to penetrate said ordnance, said tool having a rearwardly positioned shank portion, an intermediate body portion and a forwardly positioned penetrating nose portion, said body portion having a longitudinal passage and a pair of substantially transversely directed and longitudinally spaced ports communicating with said passage, penetration impeding means on said body intermediate said ports, and means securing a flexible conduit to the port remote from said nose whereby a deactivating agent may be introduced into said ordnance through said conduit port and passage thereby precluding the necessity for exposing personnel to injury by the unexpected detonation of said ordnance.

10. An apparatus for safely deactivating items of ordnance, comprising an elongated tool having a forward piercing nose portion and a rearwardly directed shank portion and an intermediate body portion, said body portion having a longitudinal passage, forwardly and rearwardly positioned ports communicating with said passage, penetration impeding means on said body intermediate said ports, a flexible conduit secured to said rearwardly positioned port, and said shank portion secured to said body at the end opposite said nose, said shank being chambered to receive a projecting cartridge whereby said tool may be fired from a mortar with the flexible conduit attached for introducing an explosive reacting agent into said ordnance in a manner precluding exposure to injury of operating personnel.

CHARLES S. PIGGOT.
CARROLL C. MISENER.

REFERENCES CITED

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

UNITED STATES PATENTS

Number	Name	Date
19,063	Warner	Jan. 5, 1858
22,863	Fisher	Dec. 8, 1859
48,371	Cousins	June 27, 1865

(Other references on following page)

UNITED STATES PATENTS

Number	Name	Date
49,548	Pierce	Aug. 22, 1865
217,899	Ough	July 29, 1879
655,577	Pell et al.	Aug. 7, 1900
1,365,870	Temple	Jan. 18, 1921
1,388,363	Miller	Aug. 23, 1921
1,393,894	McGill	Oct. 18, 1921
1,399,924	Berthelsen	Dec. 13, 1921
1,492,905	Swanick	May 6, 1924
1,492,922	Knight	May 6, 1924
1,492,924	Knight	May 6, 1924

Number
1,492,925
1,492,956
1,506,354
1,509,927
1,589,194
1,951,638
2,055,506
2,189,439
2,213,435
2,355,513
2,404,441
2,444,045

Name	Date
Knight	May 6, 1924
Botts	May 6, 1924
Allison	Aug. 26, 1924
Bowers	Sept. 30, 1924
Maxwell	June 15, 1926
Walker	Mar. 20, 1934
Schlumberger	Sept. 29, 1936
Temple	Feb. 6, 1940
Temple	Sept. 3, 1940
Cox	Aug. 8, 1944
Hopkins	July 23, 1946
Hoskin	June 29, 1948