May 6, 1924. 1,492,905

J. G. SWANICK

METHOD AND APPARATUS FOR UNLOADING HIGH EXPLOSIVE SHELLS

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Fig. 1.

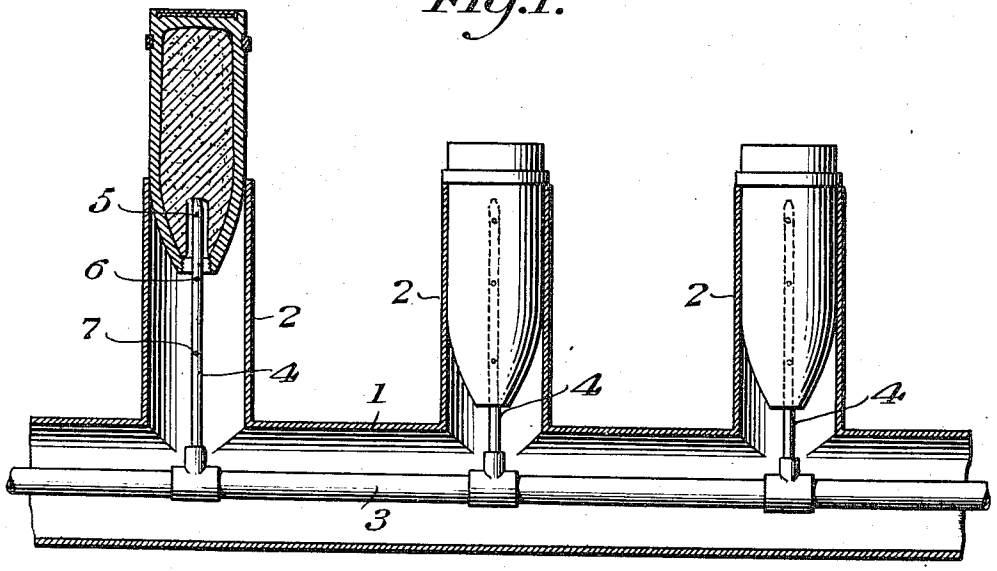
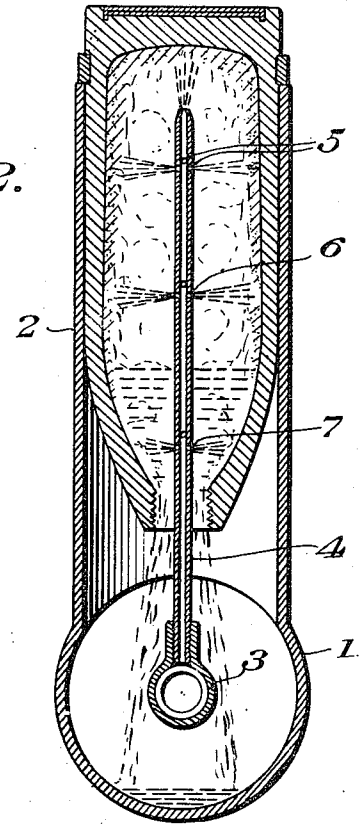


Fig. 2.



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BY
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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR UNLOADING HIGH-EXPLOSIVE SHELLS.

Application filed June 14, 1923. Serial No. 645,313.

To all whom it may concern:

Be it known that I, JOSEPH G. SWANICK, a citizen of the United States, and resident of Fords, in the county of Middlesex and State of New Jersey, have invented certain new and useful Improvements in Methods and Apparatus for Unloading High-Explosive Shells (Case No. 13), of which the following is a specification.

The main object of this invention is to provide a new and useful method and apparatus for unloading high-explosive shells. It is necessary that the entire high-explosive charge be removed from the shells in order that the empty shells may be safely melted or reduced in a blast furnace or otherwise. These shells are of high quality steel and are valuable provided the explosive charge is entirely removed.

A high explosive shell for artillery use consists, ordinarily, of a hollow steel shell filled with a charge of high explosive, said charge being substantially solid when cooled and forming a practically homogeneous dry mass which substantially fills the shell. The shell is usually pointed at one end and said pointed end is known as the nose. In the nose is formed a longitudinally extending threaded aperture in which is screwed a flanged adapter ring; and said ring carries a booster casing and a fuse. Before the shells can be unloaded, that is to say the charge removed, the adapter ring carrying the booster casing and the booster charge must be removed. The fuse, or fuse stock, is inserted only when making the shell ready for firing. A great many of these high explosive shells are charged with amatol or pure trinitrotoluol (TNT). Amatol is a mixture of ammonium nitrate and TNT in proper proportions. These high explosive charges are fluid or semi-fluid at certain temperatures and are usually poured into the shell in a fluid or semi-fluid state. When the charge cools it solidifies within the shell and becomes a substantially solid and homogeneous mass of material which completely fills the entire shell except for a small space at the nose, which space is designed to receive the booster casing.

The main purpose of this invention is to provide a method and apparatus for safely, completely and quickly removing these high explosive charges from the shells.

Fig. 1 is a longitudinal vertical sectional view of an apparatus for carrying out the invention; and

Fig. 2 a transverse sectional view taken on the line 2—2 of Fig. 1.

In carrying out this invention the adapter ring and the booster casing are first removed, thereby leaving the threaded aperture in the nose of the shell open so that access may be had therethrough to the interior of the shell. When the booster casing is removed the booster cavity in the explosive charge is open to and axially in line with the threaded aperture in the shell.

The simple form of the apparatus shown in the drawing comprises a tubular discharge channel or trough 1 of suitable diameter to receive the discharge from the shells to be treated. This discharge channel is provided with upwardly extending vertical tubular shell guides 2 spaced apart along the channel and of sufficient height to properly support and guide the shells. Each guide is open at its upper end, and is very slightly larger in internal diameter than the external diameter of the shell to be treated therein, so that the shell may slide down into the guide and have a snug fit therein.

A steam supply pipe 3 extends through the tubular channel 1; and said pipe is provided with a series of upwardly extending long slender vertical nozzles 4. Each nozzle is axially arranged within one of the tubular guides 2 and extends near to the upper open end thereof. Each nozzle is open at its upper end and is provided with three series of apertures, 5, 6 and 7 spaced a suitable distance apart along the nozzle. The upper series 5 are placed near the upper ends of the nozzles. The lower series of apertures 7 are so placed that they are a short distance within the shell when the shell has reached the limit of its downward movement in the guide.

Steam at the desired pressure will be supplied to the pipe 3 from any suitable source and said supply may be controlled by any suitable means.

The shells to be treated are arranged in an inverted position with their open pointed ends extending down into the tubular guides 3. The upper ends of the nozzles enter the booster cavity in the charge. Steam flows in fine jets through the ends of the nozzles and through the jet openings 5, 6 and 7. The shells are supported by the

nozzles, the upper ends of the nozzles resting against the bottoms of the booster cavities. The steam jets flowing through the ends of the nozzles will soften, liquefy and dislodge the material at the bottom of the booster cavity, and the nozzles will quickly cut their way through the mass of the charges. As each charge is softened and dislodged the shell will slide down into the tubular guide.

The lateral jets of steam flowing through the upper apertures 5 assist in cutting a central channel or path through the charge and also soften and liquefy the side walls of the booster cavity. The downward movement of the shell will continue until the rifling band or ring near the base of the shell rests on the upper edge of the guide. In this position of the shell the lowermost set of apertures 7 will be a short distance within the shell and in the narrow part thereof. These lower lateral jets will serve as a check to prevent a too free outflow of liquid material from the shell. A part of the steam will condense within the shell and the hot water thus produced will be swirled around by the lateral jets and assist materially in softening and liquefying the charge.

The liquid will flow from the shells into the discharge channel and then to suitable tanks.

It is desirable that the shells serve as closures for the upper ends of the guides in order to prevent waste of steam and to confine the steam so that it will serve as a means for treating the body of the shell. The shells are automatically fed by gravity to the nozzles.

What I claim is:

1. The method of removing a high-explosive charge from a shell consisting in placing a shell upright with its open end downwardly and over a long slender nozzle, loosely supporting the shell to permit it to move by gravity downwardly over the nozzle as the charge is dissolved, and supplying steam to the nozzle.

2. The method of removing a high-explosive charge from a shell consisting in placing a shell upright with its open end downwardly and over a long slender nozzle, loosely supporting the shell in a tubular guide surrounding the nozzle to permit the shell to move by gravity downwardly in the tubular guide and over the nozzle as the charge is dissolved, and supplying steam to the nozzle.

3. The method of removing a high-explosive charge from a shell consisting in placing a shell upright with its open end downwardly and over a long slender nozzle, loosely supporting the shells in cylindrical tubular guides open at their upper ends and of such an internal diameter as to have a loose sliding fit with the shell, to permit the shell to move by gravity down over the nozzle as the charge is dissolved, supplying steam to the nozzle, and providing lateral jets of steam which will progressively enter the shell as it moves down the tubular guide.

4. The method of removing a high-explosive charge from a shell consisting in placing a shell upright with its open end downwardly and over a long slender nozzle, loosely supporting the shell to permit it to move by gravity downwardly over the nozzles as the charge is dissolved, supplying steam to the nozzle, and providing lateral jets of steam which will progressively enter the shell as it moves down over the nozzle.

5. The method of removing a high-explosive charge from a shell consisting in placing a shell upright with its open end downwardly and over a long slender nozzle, loosely supporting the shell to permit it to move by gravity downwardly over the nozzle as the charge is dissolved, supplying steam to the nozzle, and providing lateral jets of steam within the shell near its lower open end, said lateral jets serving to check the outflow of liquid from the shell.

6. An apparatus for liquefying and removing a solidified explosive charge from a shell, comprising a rigid vertical upwardly extending nozzle, means for supplying steam to said nozzle, a vertical shell guide around said nozzle and open at its upper end to receive a shell, said guide being adapted to support the shell open end downward and in substantial axial alinement with the nozzle and to permit it to feed by gravity down over the nozzle as the charge in the shell is liquefied and discharged.

7. An apparatus for liquefying and removing a solidified explosive charge from a shell, comprising a long slender rigid vertical upwardly extending nozzle open at its upper end and provided with apertures in its sides at separated points longitudinally of the nozzle, means for supplying steam to said nozzle, a vertical shell guide around said nozzle and open at its upper end to receive a shell, said guide being adapted to support the shell open end downward and in substantial axial alinement with the nozzle and to permit it to feed by gravity down over the nozzle as the charge in the shell is liquefied and discharged, whereby the lateral steam jets flowing through the apertures in the sides of the nozzle will progressively enter the shell.

8. An apparatus for liquefying and removing a solidified explosive charge from a shell, comprising a rigid vertical upwardly extending nozzle, means for supplying steam to said nozzle, a vertical tubular shell guide around said nozzle and open at its upper end to receive a shell, said guide being adapted to support the shell open end downward and in substantial axial alinement with the noz-

zle and to permit it to feed by gravity down over the nozzle as the charge in the shell is liquefied and discharged.

9. An apparatus for liquefying and removing a solidified explosive charge from a shell, comprising a rigid vertical upwardly extending nozzle, means for supplying steam to said nozzle, a vertically cylindrical tubular shell guide around said nozzle, said guide being open at its upper end and having an internal diameter slightly larger than the external diameter of the shell to be treated and adapted to support the shell open end downward in substantial axial alinment with the nozzle, whereby said shell may move downwardly by gravity over the nozzle as the charge in the shell is liquefied and discharged.

10. The method of removing an explosive charge from a shell consisting in placing a shell upright with its open end downwardly and over a long slender nozzle, loosely supporting the shell in a substantially vertical position to permit it to move by gravity downwardly over the nozzle as the charge is dissolved, and supplying a highly heated moisture-carrying pressure jet to the nozzle.

11. The method of removing a solidified explosive charge from a shell consisting in placing the shell upright with its open end downwardly and over a long slender nozzle, loosely supporting the shell to permit it to move by gravity downwardly over the nozzle as the charge is dissolved, supplying a highly heated moisture-carrying pressure jet to the nozzle, and providing lateral highly heated moisture-carrying pressure jets within the shell near its lower open end, said lateral jets serving to check the outflow of liquid from the shell.

In testimony whereof I hereunto affix my signature.

JOSEPH G. SWANICK.