May 6, 1924. 1,492,957

R. H. BOTS

METHOD AND APPARATUS FOR UNLOADING HIGH EXPLOSIVE SHELLS

Filed April 2, 1923

Fig.1.

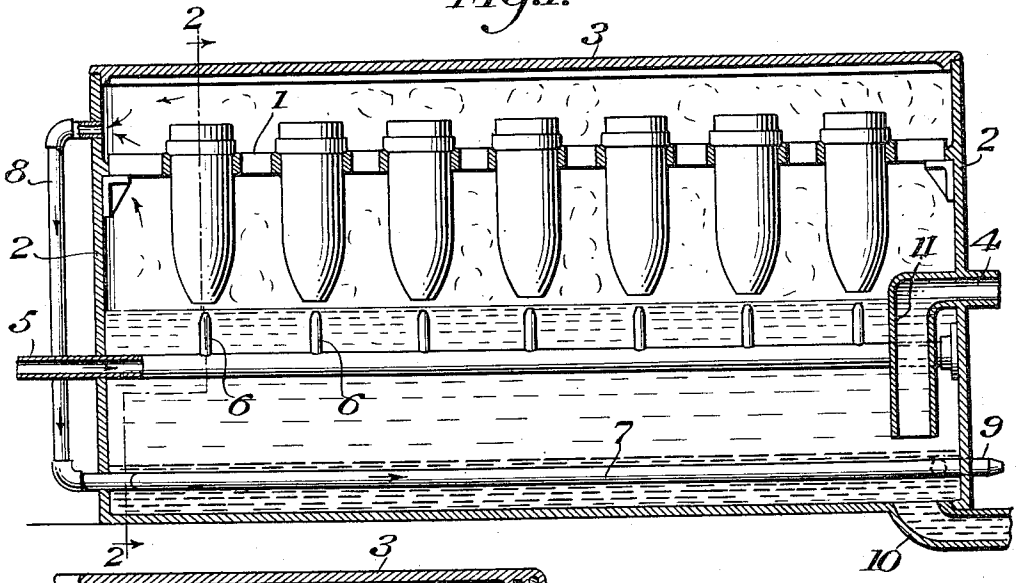


Fig.2.

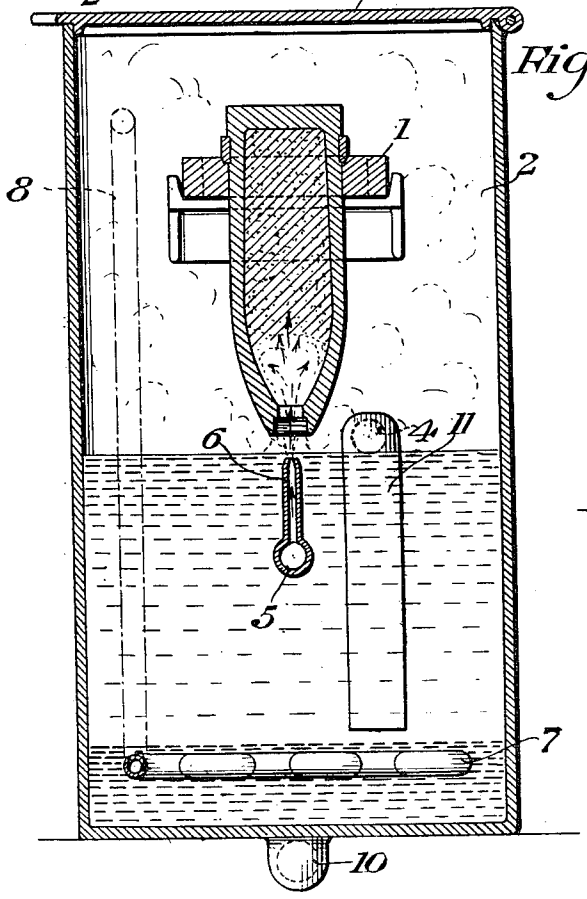


Fig.3.

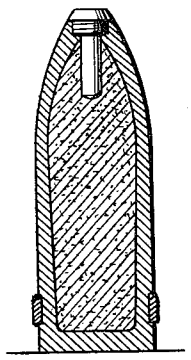
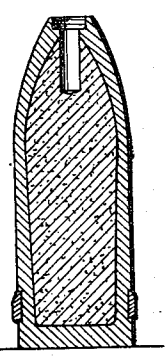


Fig.4



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UNITED STATES PATENT OFFICE.

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METHOD AND APPARATUS FOR UNLOADING HIGH-EXPLOSIVE SHELLS.

Application filed April 2, 1923. Serial No. 629,364.

To all whom it may concern:

Be it known that I, RICHARD H. BOTS, a citizen of the United States, and resident of the borough of Manhattan, in the city, county, and State of New York, have invented certain new and useful Improvements in Methods and Apparatus for Unloading High-Explosive Shells, of which the following is a specification (Case #9).

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 hard 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, pure trinitrotoluol (T. N. T.), picric acid, ammonium picrate or with a mixture of T. N. T. and picric acid. Amatol is a mixture of ammonium nitrate and T. N. T. 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 high explosive charges from the shells.

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

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

Fig. 3 a vertical sectional view of a high explosive shell showing the booster and adapter in position therein; and

Fig. 4 a vertical sectional view of the shell with the booster and adapter removed.

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. The shells are arranged in an inverted position with their open pointed ends downwardly. The inverted shells may be supported in a rack 1 which is provided with apertures through which the body of the shell may pass freely. Each shell, near its base, is provided with a ring designed to take the rifling in the gun barrel and this ring forms a convenient shoulder to engage the upper surface of the rack so that the shell will be suspended in the opening in the rack. The rack may be of any desired size to support a number of shells in inverted position. The rack 1 is preferably supported in a tank 2. As shown in the drawing the ends of the rack rest on brackets secured to the sides of the tank so that the rack may be bodily removed from the tank. The rack may be filled with shells before it is placed in the tank or the shells may be placed individually in the rack within the tank. The tank is provided with a cover 3 which may be closed after the rack and the shells are in place. A suitable quantity of water is placed in the tank and the water level is maintained just below the lower open ends of the shells in the rack. It is desirable to maintain an air space between the lower ends of the shells and the surface of the water. The outlet 4 is arranged to maintain the proper constant water level within the tank.

Extending through the tank, below the

water level is a steam pipe 5 which may be connected to any suitable source of steam pressure. The pipe 5 is provided with upwardly extending vertical steam nozzles 6. These nozzles are axially in line with the shells when the shells are in position within the tank. One nozzle is provided for each shell and its upper end is directed to the center of the opening in the shell. The nozzles terminate below the water level, that is to say, the nozzles are submerged at the normal water level in the tank. In the lower part of the tank, above its bottom, is arranged a steam coil 7. This coil may be connected to any suitable steam supply. As shown in the drawing this steam coil is connected to the upper part of the tank by means of a pipe 8 so that said coil will be supplied with steam from the steam supply in the tank above the water. The end of the coil is carried out from the tank in the form of a discharge nozzle 9 in order to insure the circulation of steam through the heating coil. The bottom of the tank is provided with an outlet 10 which may be provided with a valve or connected to any suitable means to control the flow of material therethrough. The outlet 4 is protected by a water seal or trap 11 to prevent the escape of steam therethrough.

The steam jets may be produced in any suitable manner. The nozzles 6 may be dispensed with and the steam pipe 5 alone used. Satisfactory results have been obtained by drilling small holes in the steam supply pipe and arranging the pipe just below the water lever. This construction produces the same jet effect as nozzles 6.

In operation the adapter ring and booster casing must be first removed from the shell. This leaves the shell in the condition illustrated in Fig. 4. The shells in this condition are inverted and placed in the rack 1 with their lower open ends directly over the steam nozzles 6. Sufficient water is placed in the tank to bring the water level up to normal, which will be below the lower ends of the shells. The cover 3 of the tank 2 is then closed. Steam is now admitted to the pipe 5 and blows out through the nozzles 6. The steam jets force a certain amount of water and a certain amount of steam up into contact with the solid mass within the shells. The mass within each shell is subjected to heat and water, the pressure of the steam forcing the water into the shell and producing a scouring action. This results in a softening or liquefying of the mass and causes it to drop down through the lower open end of the shell and into the water. There will be a certain amount of steam condensed but the space in the tank above the water level will be eventually filled with steam and will serve to heat the exterior of the shells. Steam will flow from this steam space of the tank through the pipe 8 into the coil 7 and serve as an additional means for heating the water. The water level will be maintained substantially uniform and normal by an out flow through the overflow pipe 4. It is manifest that as the charge from the shells drop down into the water, and as the steam condenses, the water level would rise if it were not for the overflow pipe 4.

The principal function of the steam coil 7 is to keep the water in the tank near its boiling point and, at the same time, to keep the T. N. T. in a melted condition. By keeping the water near its boiling point there will be very little condensation from the steam jets. The result of this is that when an amatol charge is treated, an ammonium nitrate solution is obtained which is concentrated and a good marketable product.

The heavy portions of the explosive charge will drop to the bottom of the tank. Usually this heavy portion of the charge is T. N. T. This heavy portion of the charge will be maintained at a high temperature, or at a sufficient temperature to keep it liquid, by the steam coil 7. The steaming operation will be maintained until the shells are free of the solidified charge. The cover 3 may then be opened and the rack of empty shells removed and a rack of untreated shells placed in the tank.

When sufficient of the heavy material, usually T. N. T., is accumulated in the bottom of the tank it may be drawn off in any suitable manner. The bottom of the tank 2 is preferably so constructed that any T. N. T. therein in liquid form will run to the outlet 10 and be either automatically discharged or drawn off in any suitable manner. After the removal of the heavy material from the bottom of the tank the normal water level must be again established and this may be done in any suitable manner.

It is manifest that by this method the material within the shells will be subjected to a maximum amount of heat, moisture and agitation or scouring and washing out action. The steam supplied to pipe 5 may be of any suitable pressure and, if desired, the pressure may be varied, that is to say, increased as the steaming operation proceeds in order to drive the steam and water to the top of the shells. The atomizing effect produced by submerging the nozzle is very desirable because by that means the water in the form of a fine highly heated spray is driven up into the shells. This has the effect of rapidly disintegrating the mass of the explosive charge. It will be understood that this fine highly heated water spray may be produced in any suitable or desirable manner; and that any liquid that will dissolve or help to disintegrate may be sprayed into the shell by a fluid under pressure. The ap-

paratus shown in the drawing for this purpose is simple, efficient and may be readily and cheaply constructed.

What I claim is:

1. The method of removing a high explosive charge from a shell, consisting in placing the shell upright in a tank with its open end downwardly, placing a supply of water within said tank, maintaining the level of said water slightly below the lower open end of the shell, placing a steam nozzle in said tank slightly below the water level whereby said nozzle will be slightly submerged in the water, said nozzle being directed upwardly and arranged directly below the lower open end of the shell, and supplying steam to said nozzle whereby a steam jet will be directed upwardly through the water and into the shell.

2. The method of removing a high explosive charge from a container, consisting in subjecting the charge to a highly heated water spray produced outside of the container by a steam jet arranged outside of the container and directed into the container through an opening therein whereby the highly heated water spray is sprayed from its point of production into the container.

3. The method of removing a high explosive charge from a container, consisting in subjecting the charge to a highly heated water spray produced outside of the container by a jet of highly heated fluid under pressure arranged outside of the container and directed into the container through an opening therein whereby the highly heated water spray is sprayed from its point of production into the container.

4. The method of removing a high explosive charge from a container, consisting in subjecting the charge to a highly heated water spray produced outside of the container and directed and sprayed from its point of production into the container through an opening therein.

5. The method of removing a high explosive charge from a container, consisting in subjecting the charge to a highly heated liquid spray produced outside of the container by a jet of fluid under pressure arranged outside of the container and directed into the container through an opening therein whereby the highly heated water spray is sprayed from its point of production into the container.

6. The method of removing a high explosive charge from a shell, consisting in placing the shell upright with its open end downwardly, subjecting the charge to a highly heated liquid spray produced outside of the container by a jet of fluid under pressure arranged outside of the shell and directed into the shell through the lower open end thereof whereby the highly heated water spray is sprayed from its point of production into the container.

7. An apparatus for removing a high explosive charge from a shell, comprising a tank, means for maintaining water therein at a fixed level, means for supporting a shell in an inverted position within the tank with its open end downwardly and slightly above the surface of the water, a steam nozzle supported in the tank directly below the lower open end of the shell below the water level and directed upwardly, and means for supplying steam to said nozzle.

8. An apparatus for removing a high explosive charge from a shell, comprising a closed tank, means for maintaining water therein at a fixed level, means for supporting a shell in an inverted position within the tank with its open end downwardly and slightly above the surface of the water, a steam nozzle supported in the tank directly below the lower open end of the shell below the water level and directed upwardly, and means for supplying steam to said nozzle.

9. An apparatus for removing a high explosive charge from a shell, comprising a closed tank, means for maintaining water therein at a fixed level, means for supporting a shell in an inverted position within the tank with its open end downwardly and slightly above the surface of the water, a steam nozzle supported in the tank directly below the lower open end of the shell below the water level and directed upwardly, means for supplying steam to said nozzle, a steam coil arranged near the bottom of the tank below the water level, and means connecting said steam coil to the interior tank above the water level.

In testimony whereof I hereunto affix my signature.

RICHARD H. BOTS.