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T. F. KNIGHT

METHOD AND APPARATUS FOR UNLOADING HIGH EXPLOSIVE SHELLS

Filed June 30, 1923

Fig. 1.

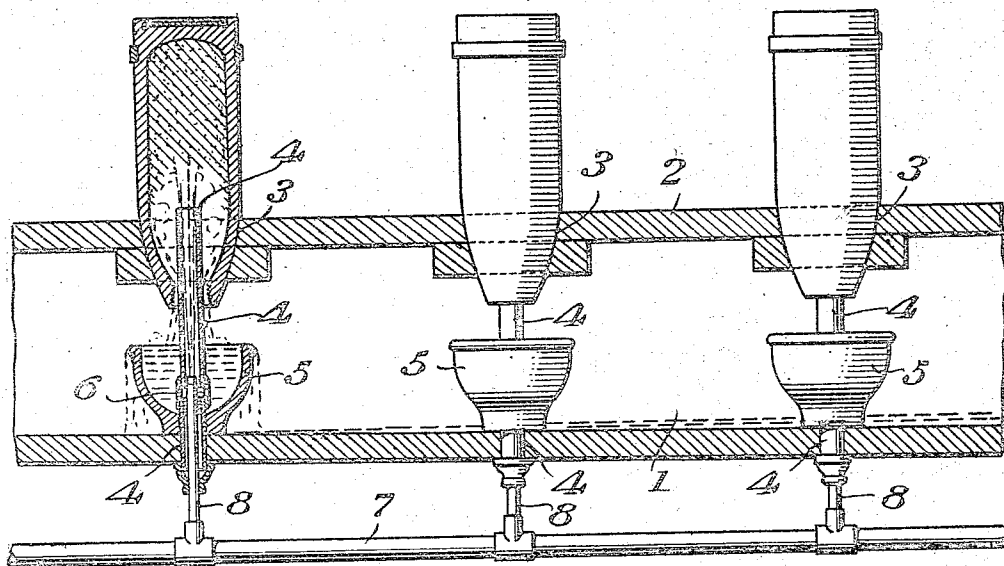


Fig. 2.

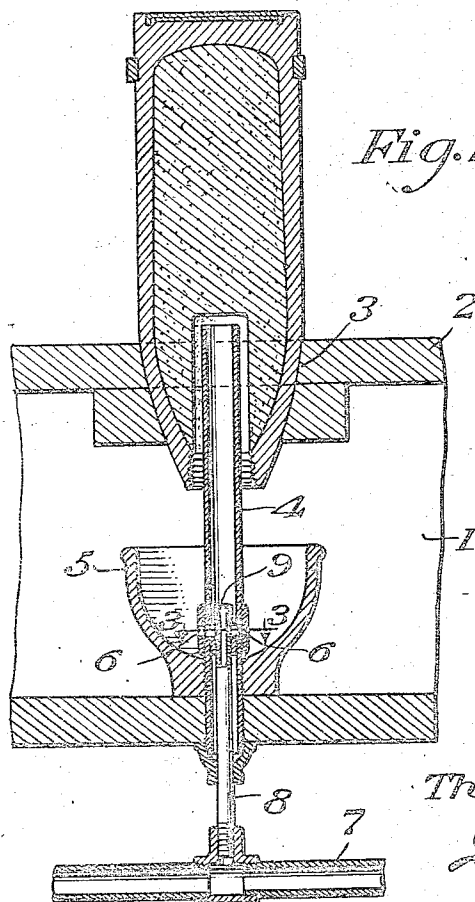
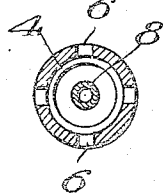


Fig. 3.



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METHOD AND APPARATUS FOR UNLOADING HIGH-EXPLOSIVE SHELLS.

Application filed June 30, 1923. Serial No. 648,710.

To all whom it may concern:

Be it known that I, THOMAS F. KNIGHT, a subject of the King of Great Britain, and resident of Lyndhurst, in the county of Bergen and State of New Jersey, have invented certain new and useful Improvements in Methods and Apparatus for Unloading High-Explosive Shells (Case No. 12), 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 as 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.

In the drawing, Fig. 1 is a longitudinal vertical sectional view, partly in side ele-

vation, of an apparatus for carrying out the invention;

Fig. 2, a view similar to Fig. 1, of a portion of the apparatus shown on a larger scale; and

Fig. 3 a transverse sectional view on the line 3—3 of Fig. 2.

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 a top wall 2 in which is formed a series of shell receiving circular apertures 3. These apertures are cup-shaped, the walls thereof curving downwardly and inwardly so that the apertures taper toward their lower ends. These cup-shaped apertures are adapted to receive the tapered ends of the shells and to serve as holders to maintain the shells upright with their lower open ends projecting into the channel. Rigidly secured in the bottom of the trough 1 are spray nozzles 4. Each nozzle is secured by suitable clamping means and extends up through the bottom of the trough axially in line with one of the apertures 3 in the top of the trough. The upper open end of the nozzle extends through said aperture so that when a shell is placed in position the nozzle will project through the threaded aperture in the nose thereof and into the booster cavity. Preferably the parts are so arranged and proportioned that the upper open end of the nozzle will extend close to the inner end or bottom of the booster cavity when the shell is supported in the cavity 3.

Each spray nozzle is provided within the trough with a cup 5, the nozzle extending axially through it. As shown in the drawing the cup is formed with a central threaded aperture in its bottom to receive a threaded portion of the nozzle, and the under side of the cup is clamped firmly against the

upper surface of the bottom of the trough. Each nozzle is provided with apertures 6 within and near the bottom of the cup so that liquid may enter the nozzle from the cup and the cup extends a considerable distance above the said apertures.

A steam supply pipe 7 is arranged below the trough and said pipe is provided with upwardly extending steam jet nozzles 8. Each steam nozzle extends axially up into one of the nozzles 4 and terminates just above the aperture 6. The upper end of the steam nozzle is provided with a small aperture 9 through which a steam jet may flow. Steam is supplied to the pipe 7 from any suitable source; and may be controlled by any suitable means.

In operation the steam jets from the nozzles 8 blow up through the nozzles 4 and into the booster cavities in the explosive charges. Some of the steam will be condensed and the hot water thus formed will flow down into the cups 5. Some of the material of the charge will be liquefied and that will also flow down from the shells and into the cups 5. As the liquid accumulates in the cups it will flow through the apertures 6 into the spray nozzles 4, and as it rises therein above the steam jet nozzles 8 it will be blown up into the shells by the steam jets. The hot liquid thus blown up into the shells and swirled around therein by the steam will assist greatly in softening and liquefying the explosive charge. The cups 5 will fill with liquid and maintain a constant level of liquid above the upper end of the jet nozzles 8. This constant liquid level will ensure a uniform supply of hot liquid to the steam jets. When the cups 5 are full the surplus liquid will overflow into the trough 1 and then flow to suitable tanks.

What I claim is:

1. An apparatus for liquefying and removing a solidified charge from a shell, comprising a support adapted to hold a shell in upright position with its open end down-

ward, a spray nozzle adapted to extend upwardly into the shell through the open lower end thereof, means for rigidly supporting said nozzle, a cup surrounding said spray nozzle below the shell support, apertures being formed through the said nozzles within the cup, a steam supply pipe below the said nozzle, and a steam jet nozzle connected to said supply pipe and extending up into the spray nozzle, the upper end of the steam nozzle being above the perforations in the said spray nozzle but below the upper edge of the cup, the upper end of the steam nozzle being formed with an aperture.

2. An apparatus for liquefying and removing a solidified charge from a shell, comprising a support adapted to hold a shell in upright position with its open end downward, a spray nozzle adapted to extend upwardly into the shell through the open lower end thereof, means for rigidly supporting said spray nozzle, means for supporting and maintaining a small body of liquid around said spray nozzle at a uniform depth, apertures being formed through the said nozzle at a point below the level of the said body of liquid, a steam supply pipe, and a steam jet nozzle connected to said supply pipe and extending up into the spray nozzle, the upper end of said steam nozzle being formed with an aperture.

3. The method of removing a solidified explosive charge from a shell consisting in placing the shell with its open end directed downwardly, inserting a spray nozzle in the open end of the shell, confining a small body of liquid around the spray nozzle and maintaining said liquid at a constant level, directing a jet of steam up through the spray nozzle and permitting the liquid to flow into the spray nozzle below the steam jet, and maintaining the level of the confined body of liquid above the steam jet aperture.

In testimony whereof I hereunto affix my signature.

THOMAS F. KNIGHT.